RAILROAD GAZETTE

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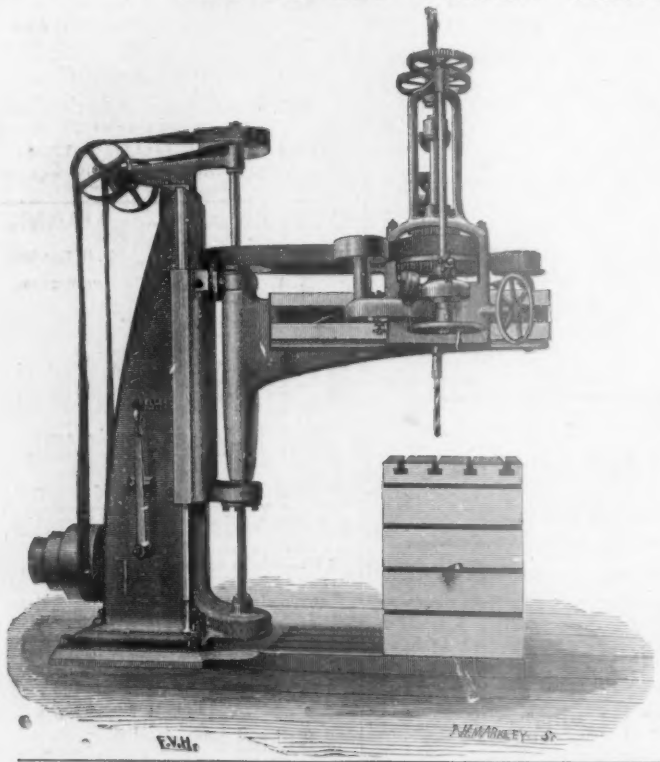

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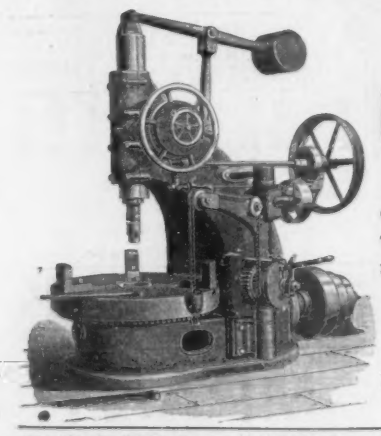

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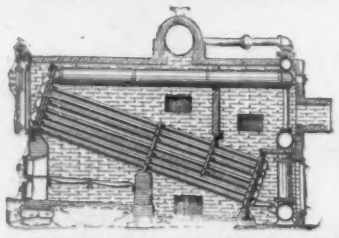

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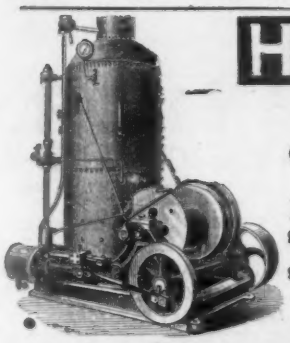

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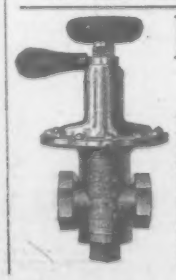

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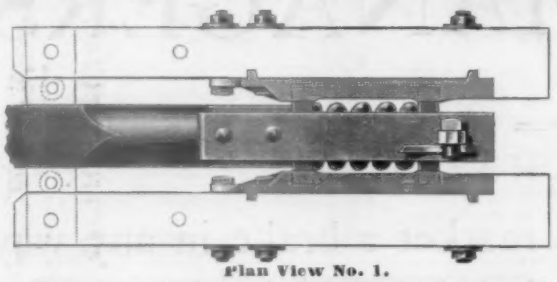

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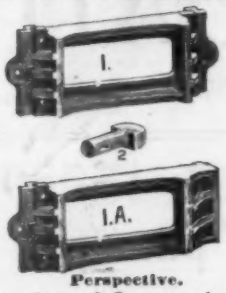

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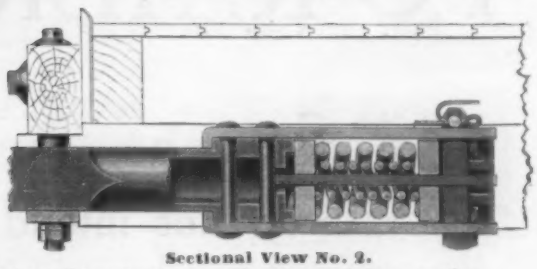

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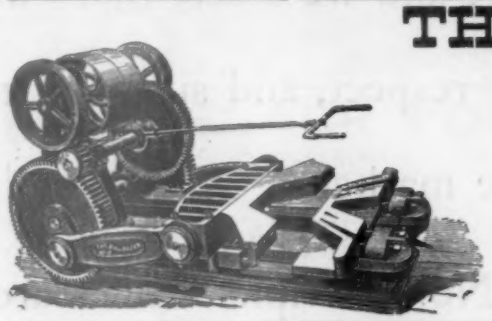

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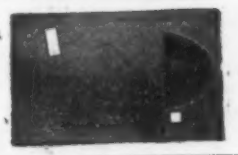

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Hartford Woven Wire Mat. Co. 16
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Hunt, Robt. W. & Co., The 1
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Illinois Steel Co. 18
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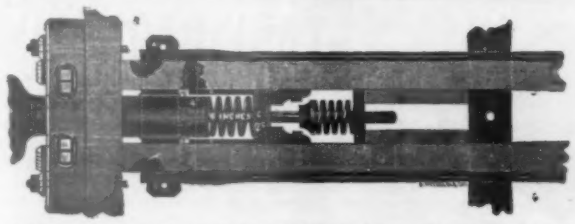

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C W Hunt Co., 45 B'way, New York.
King Bridge Co., Cleveland, O.
Lidgerwood Mfg. Co., 96 Lib'ty S.t., N.
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Industrial Works, Bay City, Mich.
Lidgerwood Mfg. Co., 96 Liberty St., N.Y
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Vulcan Iron Works, Chicago.
Hollow Stay Bolt Iron
Falls Hollow Stay Bolt Co., Cuyahoga Falls, O.
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Joseph F. McCoy Co., 26 Warren St., N.Y
Watson & Stillman, 210 E. 43d St., N. Y.
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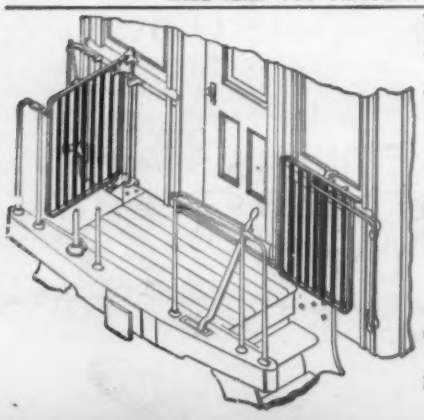

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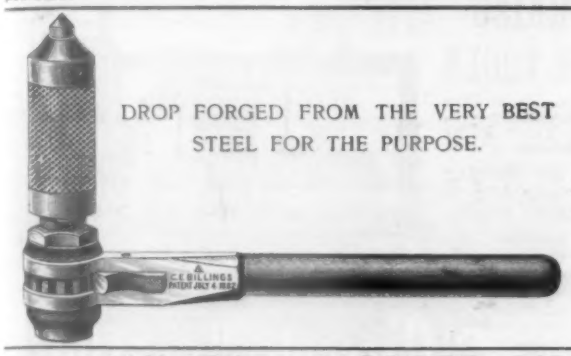

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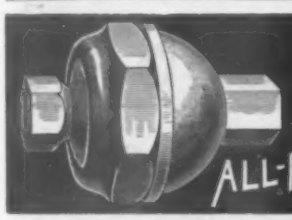

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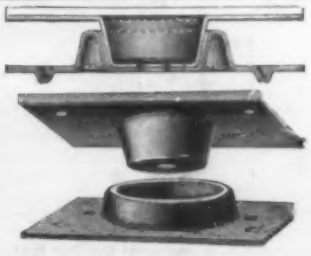

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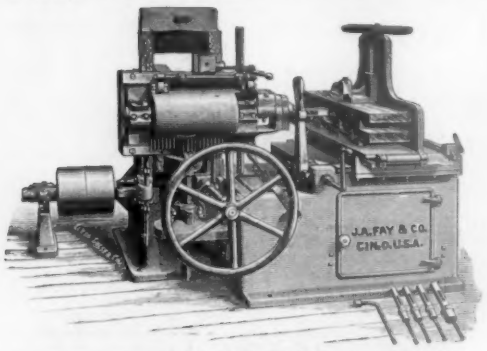

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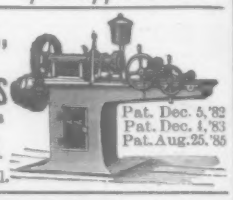

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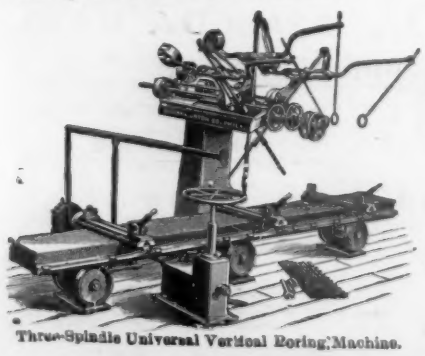

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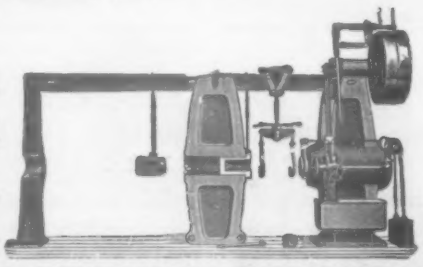

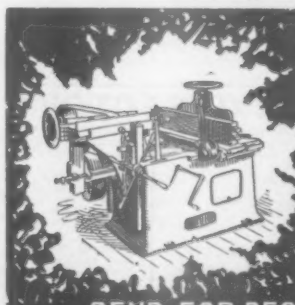

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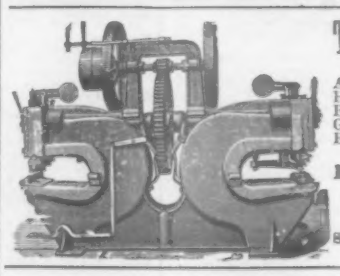

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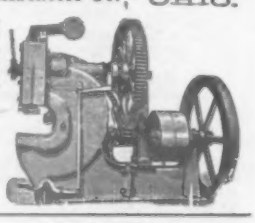

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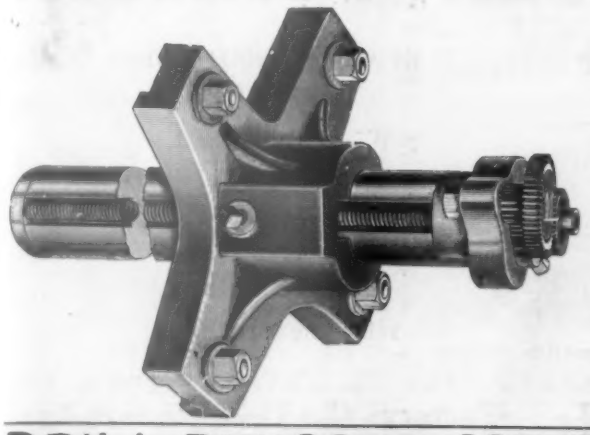

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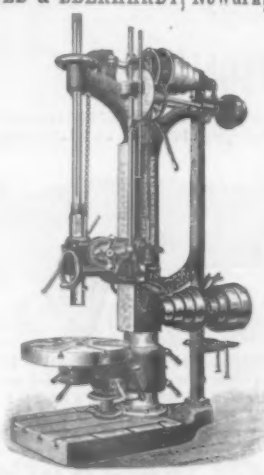

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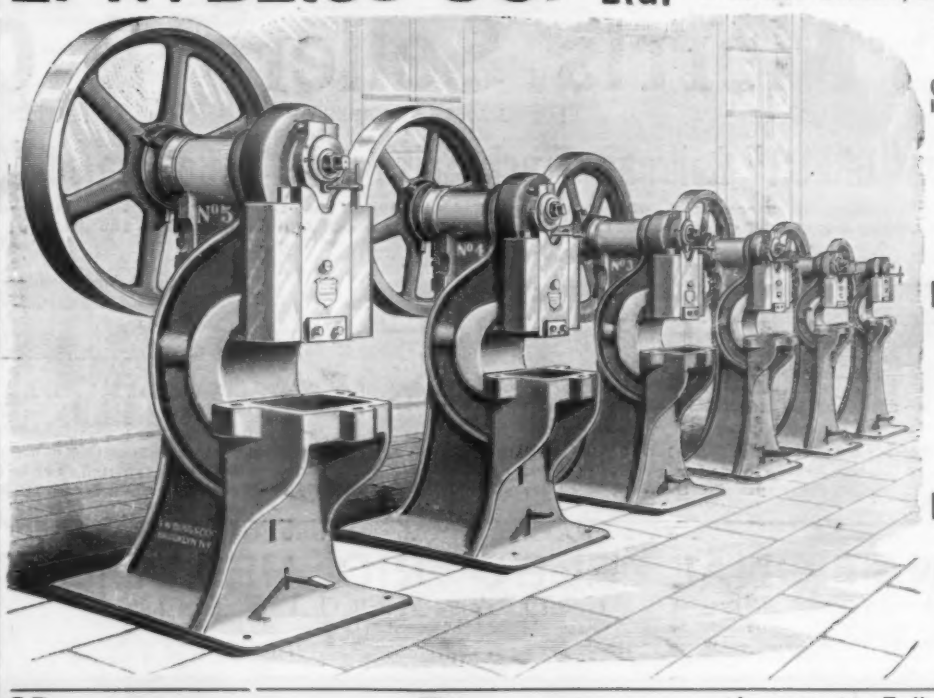

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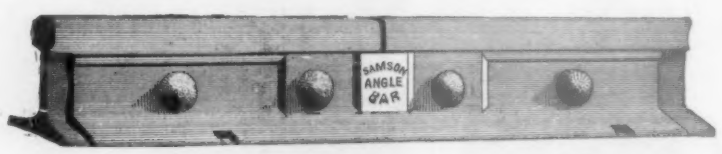

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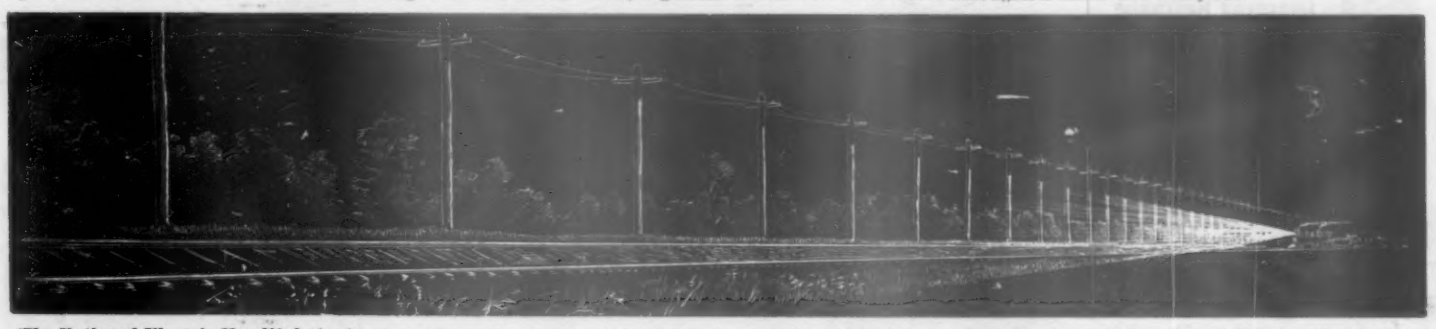

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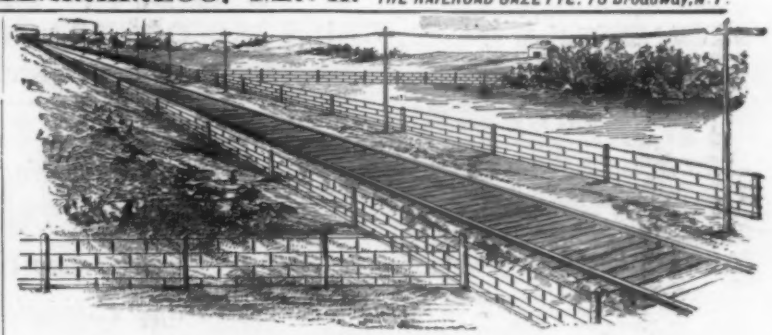

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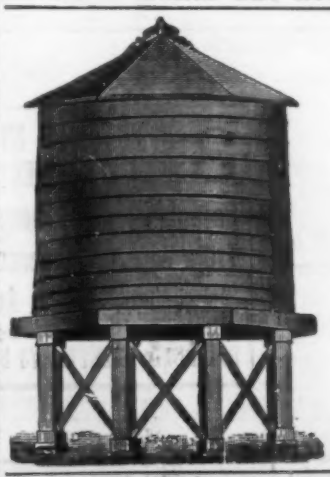

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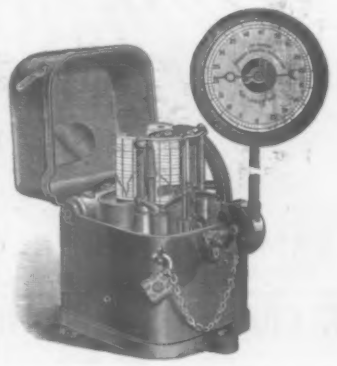

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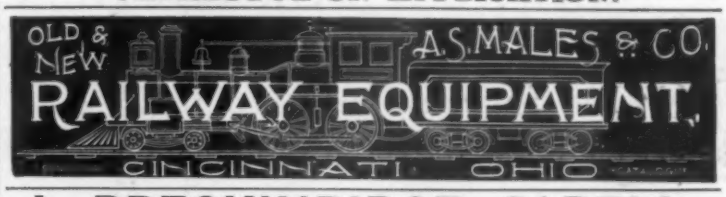

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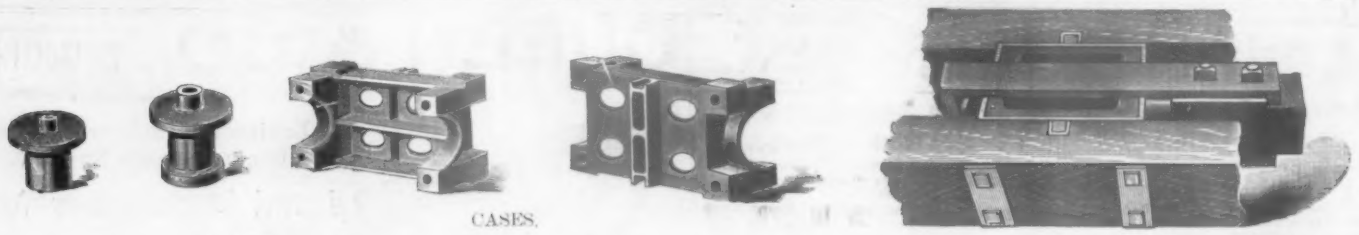

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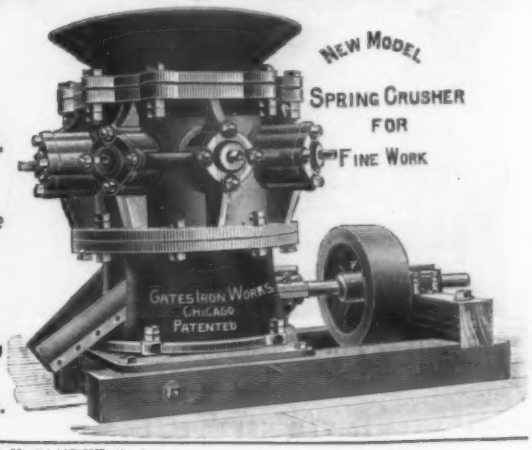

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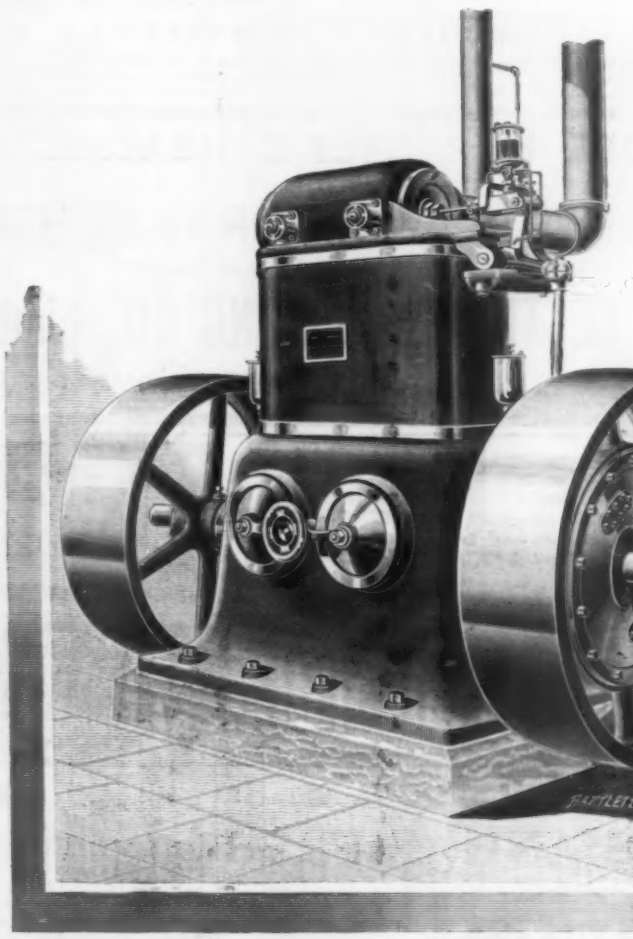

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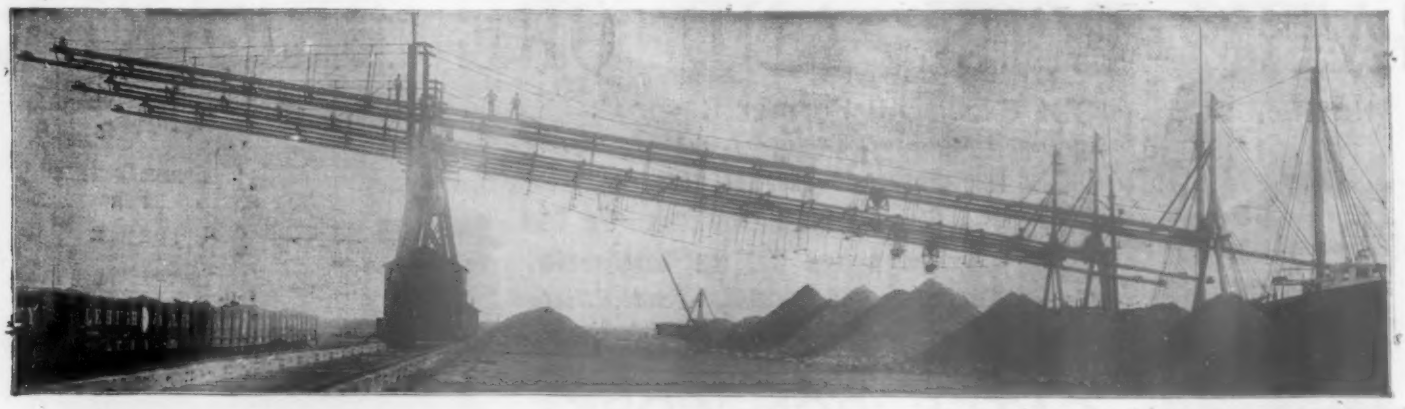

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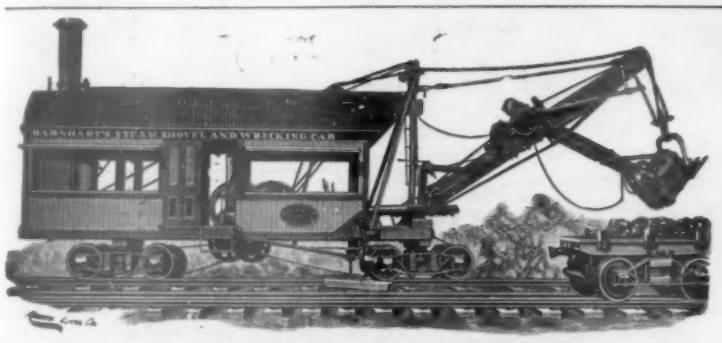

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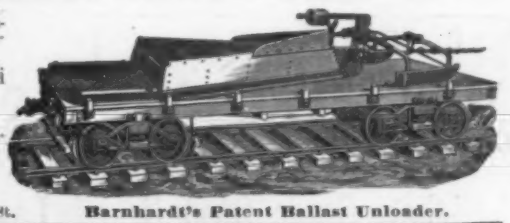

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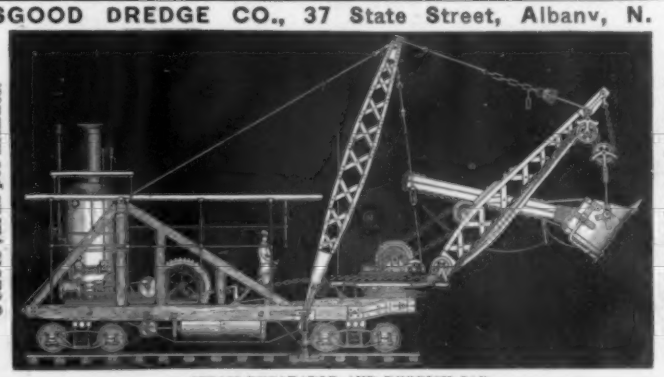

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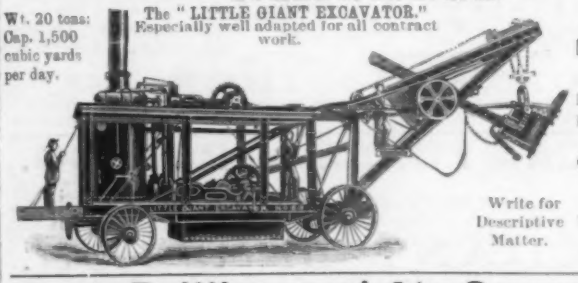

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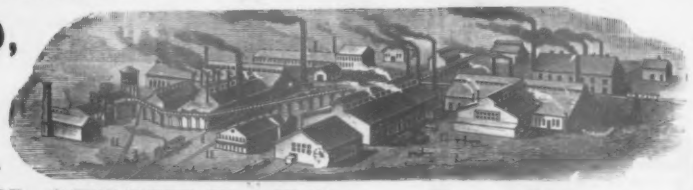

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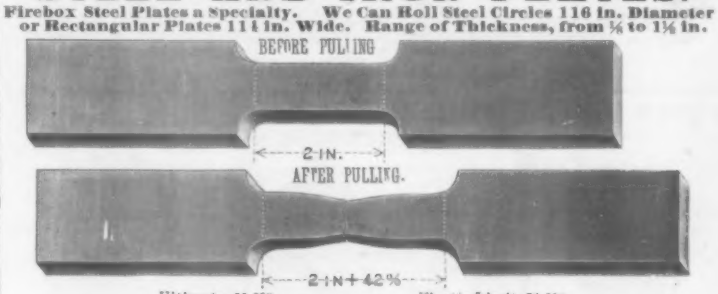

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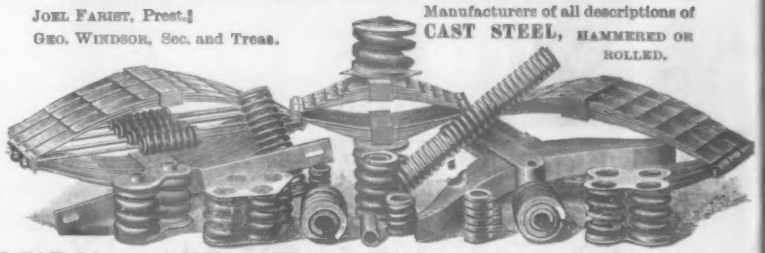

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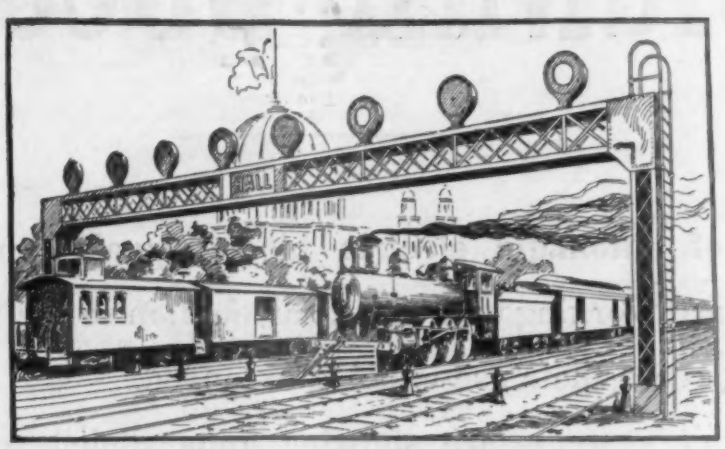

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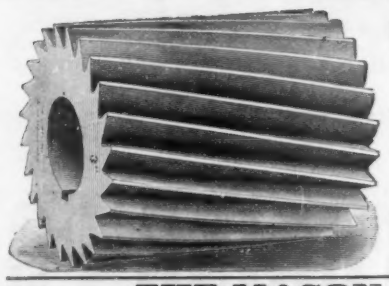

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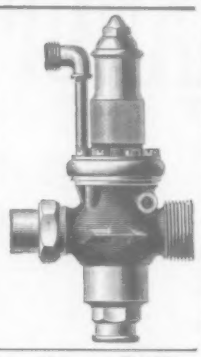

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RAILROAD GAZETTE

FRIDAY, JULY 22.

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The Union Switch & Signal Co.,
SWISSVALE, Pa., July 18, 1892.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your issue of July 15, and in the article on the combination of the Hall and Johnson Signal companies, and particularly referring to the paragraph which reads, "The consolidated concerns will now control the Sykes system and the Bezer 'Lock and Block' system, etc.," we beg respectfully to state that the Bezer "Lock and Block" system, in our judgment, is nothing more or less than a part of the Sykes system, and that the control or exclusive license for the manufacture and sale of the Sykes system, under certain royalties, was purchased by the Union Switch & Signal Co. in 1882, and that the Union Switch & Signal Co. are in reality the owners and sole manufacturers of this class of signaling for the United States. The article, therefore, might be very misleading to many people, and I take this means of laying the true situation before the public. We also beg to state that this company proposes to and will protect their rights in this invention in every particular.

The UNION SWITCH & SIGNAL CO.
E. H. GOODMAN, *Vice-Pres. and Gen. Man.*

Tie Plates and Shearing of Spikes.

CHICAGO, July 12, 1892.

TO THE EDITOR OF THE RAILROAD GAZETTE:

We note in an article entitled "A New Tie Plate and Spike," which appeared on page 507 of your issue of July 8, 1892, that in reference to plain surface plates the following statement appears: "We have been informed of cases in which many consecutive spikes have been sheared off." In view of the fact that the Servis is a plain surface plate we would respectfully ask for the source of such information that we may be enabled to ascertain the correctness of the report? This is a matter we have followed very carefully and in the millions of plates which we have in service the first report of such a character is yet to be made. Rumors to the same effect have come to us, which we have traced to their source, and in each case we have been advised by the officers of the lines mentioned that there was not a particle of truth in it. It is certainly due ourselves as well as the *Railroad Gazette* that the correctness of the statement be established or disproved, for which reason we respectfully request that the authority be made public and the instances referred to be stated, with circumstances of detail as to time and place. THE Q. & C. COMPANY.

[We will give the Q. & C. Company the following circumstances to explain. It may be that "the boy lied," but the story comes to us through a responsible officer of a very large system. He says: "A correspondent speaks of an accident that happened on the Ohio division of the B. & O., of another on the Rock Island. The track was laid with Servis tie plates and common iron spikes in both cases. The B. & O. accident was on a curve and at a speed of about 50 miles an hour. The spikes were sheared clean on the outside rail. The Rock Island accident was on a piece of new track with oak ties, straight line and a moderate speed. In this case 1,100 feet of rail went out, shearing every spike on the outside. Neither rails nor splices were broken, but the gauge was slipped out." Now this, we confess, was staggering, but the same officer tells of experiences on his own lines which make the story above seem less improbable, to say the least.—EDITOR RAILROAD GAZETTE.]

Shrinkage of Driving Tires.

JERSEY CITY, N. J., July 18, 1892.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Referring to the letter of the Midvale Steel Co. on this subject, published in your last issue; the following figures show the shrinkage recommended in the Midvale table and the practice of the Pennsylvania Railroad:

	Midvale		P. R. R.
Size of centre.	Shrinkage.	Bored size of tire.	Shrinkage.
in.	in.	in.	in.
37	.039	36.961	031
38	.040	37.960	.021
44	.046	43.954	.047
50	.052	49.948	.0625
56	.058	55.942	.0625
62	.065	61.935	.078
73	.076	72.924	.0937

The Pennsylvania Railroad allowances are in most cases greater than those given in the table, especially for larger sizes. A 62-in. and 73-in. centre goes on a 68-in. and 78-in. wheel, respectively. Tires on those wheels are not turned down thinner than 1⅝ in. and 1¾ in. respectively, and we quite often have loose tires before they are too badly worn after this last turning, and before they reach the limit of thickness for withdrawal. It would seem, then, that you can get a tire that will not break before getting loose with even a higher shrinkage than that given in the table.

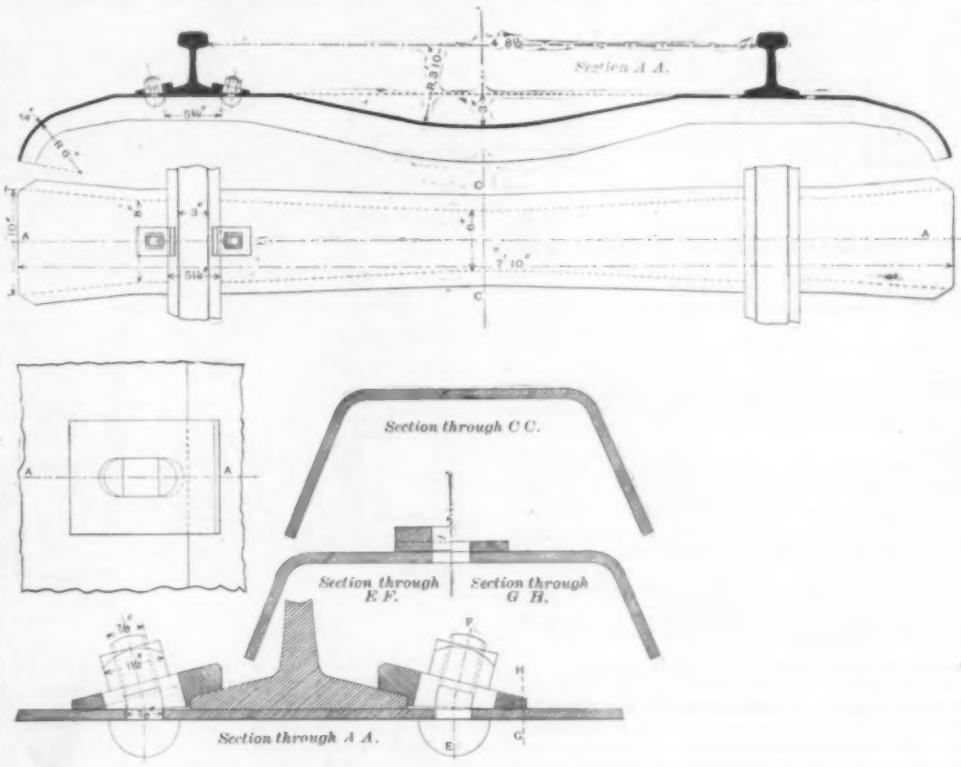
If we are to reduce the shrinkage we would have to introduce some other method of fastenings for large wheels. Some tires that are very hard will break at a thickness of 2 in. to 2⅛ in. This is noticeably the case with those of the "Standard" brand.

This much theoretically; practically, when it comes to turning up a 62-in. or 73-in centre and tire to fit, it becomes very hard in a locomotive machine shop to make a difference of .013 or .0177 in. So, perhaps, the conclusion of the whole matter may be, get a pretty soft tire that will not break, don't shrink it too much, and rely upon some good form of bolt through the centre to keep the tire from slipping when worn down.

S. PORCHER.

A New Steel Tie.

Several months ago (Feb. 26, 1892) we gave particulars of the work that the New York Central & Hudson River Railroad is doing in the Fourth avenue tunnel toward providing actual "permanent way." It will be remembered that the work includes putting down 100-lb. rails on steel ties. We show now the design of a tie, of which 18,000 are now being made for this work by the Schoen Manufacturing Co. It will be seen that it is, in the main, of a well known type, but the clip is a modification of that designed, we believe, by Mr. Katté, and used with the Hartford tie laid down on the Hudson River road some three years ago. The clip now used is of soft, rolled steel, instead of cast iron. The adjustable feature is retained, and gives this tie certain advantages over those of the "inseparable clip" type, which are treated at considerable length in another article. One of the great difficulties of manufacture is removed, and the gauge may be adjusted by the actual gauge line, and not by the rail flange. The approximate weight of this tie, with the fastenings, is 100 lbs.



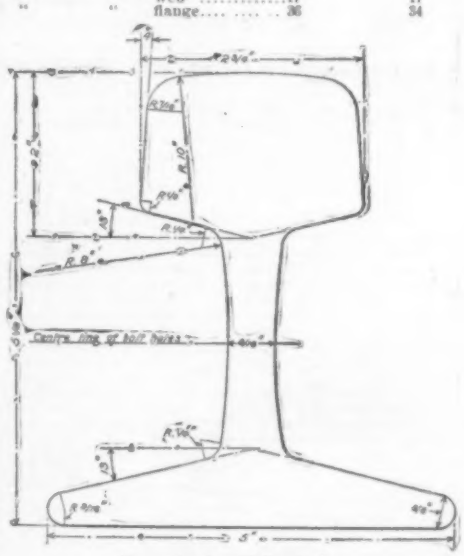
Pressed Steel Tie for the New York Central & Hudson River Railroad.

Made by the SCHOEN MANUFACTURING COMPANY, *Pittsburgh, Pa.*

100-lb Rail for the Pennsylvania Railroad.

The Pennsylvania Railroad Company has just ordered 2,000 tons of rails of 100 lbs. section. These are to be used in the main line, as an experiment; the exact point at which they will be laid is not yet definitely decided upon. The section is shown to half size in the engraving. It will be seen that it is very close in design to the 85-lb. rail heretofore used as the heaviest standard of the company. It is not designed in accordance with the ideas that are most popular now among engineers who talk about the question of rail sections; nor is it likely to be very close to the standard which the Committee of the American Society of Civil Engineers will recommend, although it may be that the Committee will recommend two series of standards to satisfy the notions of the heavy headers and the light headers. The dimensions and distribution of metal of this rail and of the Pennsylvania Railroad standard 85-lb. rail, where they differ at all are shown below. Otherwise they are identical:

Weight per yard	85 lbs.	100 lbs.
Height	5 in.	5⅛ in.
Greatest width of head	2⅝ in.	2¾ in.
Depth "	1⅝ in.	2 in.
Least thickness of web	½ in.	7/16 in.
Per cent. of metal in head	47	49
" " web	17	17
" " flange	36	34



Pennsylvania 100-lb. Rail.
Half size.

The percentages are probably subject to some slight corrections, as they have been hastily computed and not checked by a planimeter, but they are pretty close. According to our notions the change in this respect has been in the wrong direction.

The Vaudreuil Aqueduct.

The Secretary-Treasurer of the Municipal Council of Vaudreuil, Que., will receive tenders until the 21st inst. for the construction of an aqueduct over seven miles in length.

Standard Six Wheel Switcher—Baltimore & Ohio Railroad.

[WITH AN INSET.]

The six wheeled switcher shown in the engravings is one of the new standards of the Baltimore & Ohio Railroad. The following are the general dimensions:

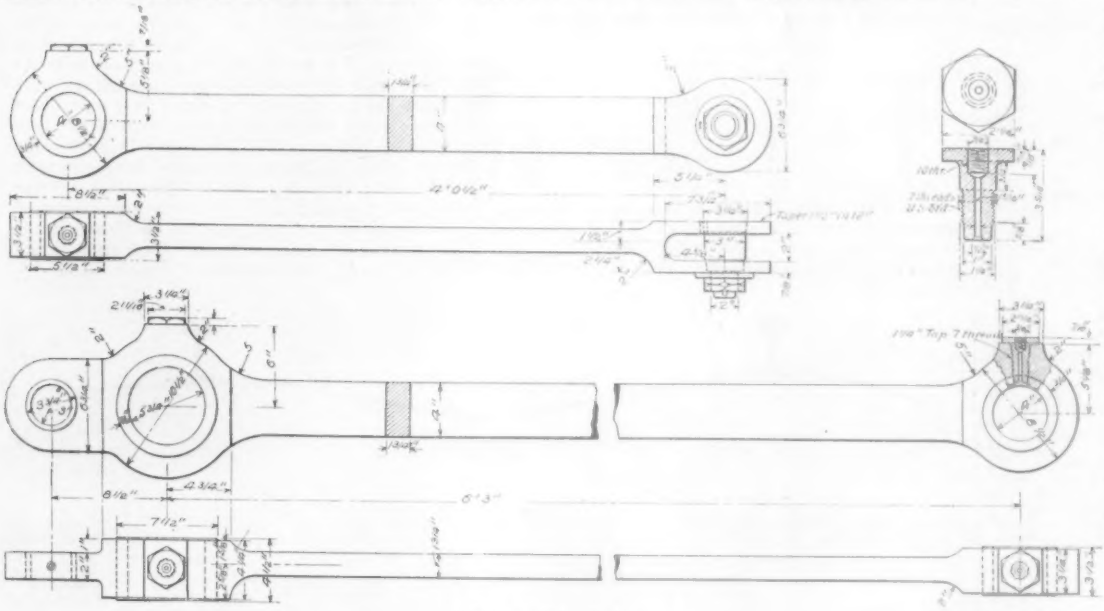


Fig. 3—Side Rods.

Cylinders	19 in. × 24 ins.
Pistons	Solid, with cast iron steam packing.
Valves	Richardson balanced, ¾ in. outside, ⅛ in. inside lap.
Guides, Laird type, crossheads cast steel, U. S. metallic packing.	
Drivers	50 in. diameter.
Weight on drivers	100,600 lbs.
Tires	Four flanged, 5½ in. wide; two plain, 7 in. wide.
Driving and total wheel base	11 ft.
Boiler: 53 in. outside, straight top, sheets ½ in. steel, steam pressure, 165 lbs.	
Tubes	144, 2¼ in., O. D. 14 ft. 4 in. long.
Firebox; 72 in. deep, 34⅛ in. wide at bottom, 46 in. at top, 67¾ in. high in front, 64¾ in. back.	
Radial stays	1 in. diameter.
Water space	3 in. side and back, 4 in. front.
Driver brakes	American. Tender brakes Westinghouse.
Tender: 4-wheel centre bearing trucks; wheels, 33 in. diameter, steel axles with M. C. B. standard journals, 3¾ × 7 in.; sloping tank, 2,400 galls. capacity.	

Among the admirable details of construction is the method of holding the parallel rods on the front pins (see fig. 4.) The pin is turned out to receive the washer, which is counterbored to receive the head of the bolt. The bolt passes entirely through the pin. The pin is bored out at the back to take the nut of the bolt, which is screwed up by a socket wrench. The nut is held by a cotter. This makes a close, compact and neat arrangement for a front pin. The side rods have rectangular sections and solid ends. A 1¼-in. wrought iron bushing is inserted in the ends of the rods into which the cup is then screwed (see fig. 3). This bushing acts as a retaining pin for the brass bushings.

side strips, as shown in fig. 7. The dome is double riveted to shell, which is strengthened at base of dome by a 1 × 4 in. reinforcing ring (see fig. 2).

A very good method of constructing the fire door is shown in the longitudinal section of boiler, fig. 2. The back head sheet is cut out larger than the fire door opening, to allow the furnace door ring to pass through it. The back sheet of the firebox is flanged, and to it is riveted a collar which projects through the back head. A flanged ring is riveted to the back head sheet, and between it and the collar a copper fire door ring is placed, and the whole riveted together. This construction prevents mud or scale collecting at this point, and no burning of the firebox sheets can occur at the door. The usual longitudinal stay rods between the back head and front flue sheets are supported as shown in fig. 2. This prevents vibration or loosening of the rods in the sheets. The extension front is 18 in. long, and has the usual spark arrester and cinder hopper.

The cab is of a very neat design, having rounded corners and covered with ⅛ in. iron on the front and sides. The roof is covered with No. 27 B.W.G. galvanized iron. Doors are placed both front and back, making the cab entirely inclosed. A ventilating trap is placed in the roof, and ventilating dampers are placed beneath each front door.

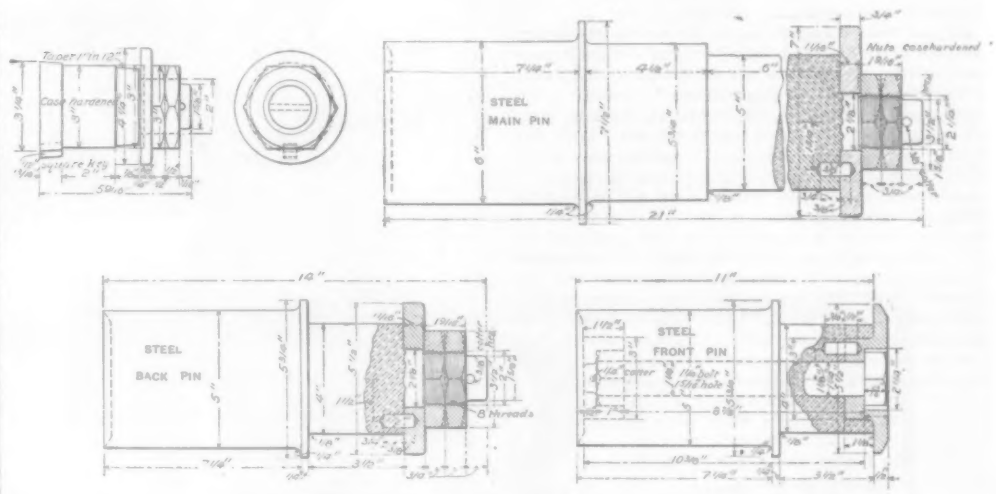


Fig. 4—Crank Pins.

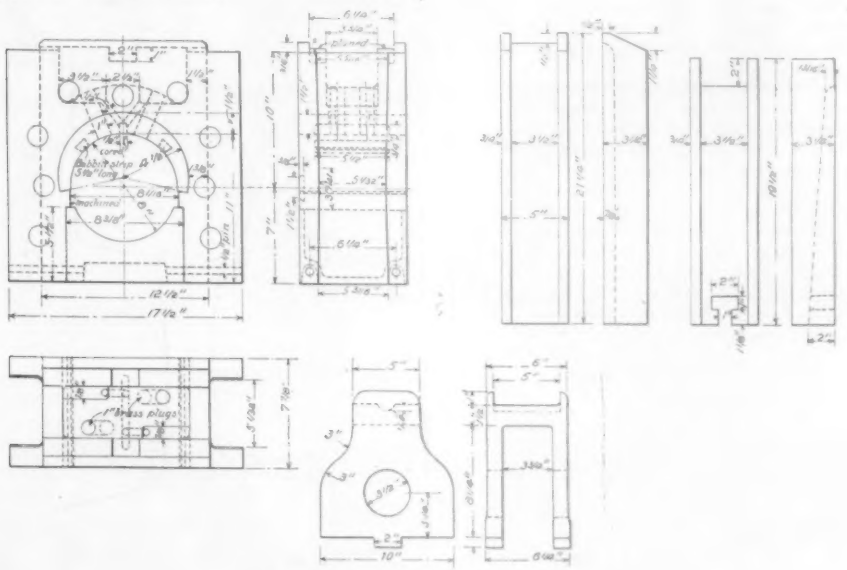


Fig. 5—8" × 8" Driving Box and Details.

DETAILS OF BALTIMORE & OHIO SWITCHER.

The driving box guides, fig. 5, are planed taper both ways from the centre with a central flat space 3 in. long. This allows freedom of the boxes, when the wheels drop, while crossing low joints, frogs or switches.

The smoke stack, fig. 6, is of cast iron, ⅝ in. thick. Its smallest internal diameter is 18⅝ in. and tapers to 23⅝ in. at the top. In the longitudinal seams of boiler the plates are butted and reinforced by inside and outside strips.

The Lack of Railroads in California.

BY M. J. LORRAINE, C. E.

People of the East think of California as the Golden State, and a land of promise, wealth and activity, and associate with its people a dash and enterprise which is believed to be the peculiar attribute of the West. But, although singularly favored by nature and position, with an equable climate, bountiful agricultural resources, its hills stored with every variety of minerals and their surface covered with the finest forests, with grand scenic attractions, the Pacific tributary on the west, and on the east a territory rich in mining, agricultural and timber resources, much of which seeks a natural outlet to the coast, yet California of to-day is more lifeless and stagnant than any other portion of the United States. In its principal city, San Francisco, trade is dull and unprofitable, and many old firms are going out of business; vacant houses are numbered by the thousand, and complaints of dull times are heard from every lip. The pioneers, whose pluck and enterprise gave to the farther West its early vigor, have either died or are now old men, and their children have lived in fancied security, not knowing the need of effort, and with the quality entirely lacking, or dormant because of apparent lack of necessity for its use.

While the majority of the people have been living on the golden results and reputation of the past a few men of shrewdness and foresight have been gradually building and absorbing the means of transportation to and within the state until California stands in the novel position of a state having practically but one railroad. The result has been disastrous to the welfare and progress of the commonwealth. Discriminations have been made, high rates of freight have been sustained, politics and the courts have been controlled, and every means and channel utilized to advance the interests and the

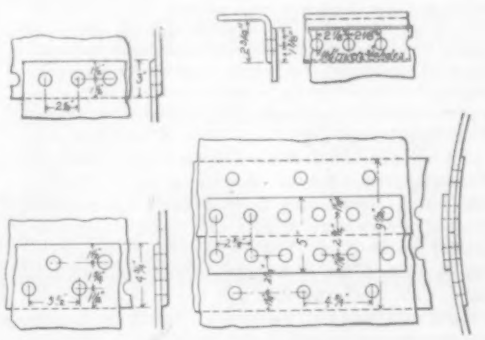
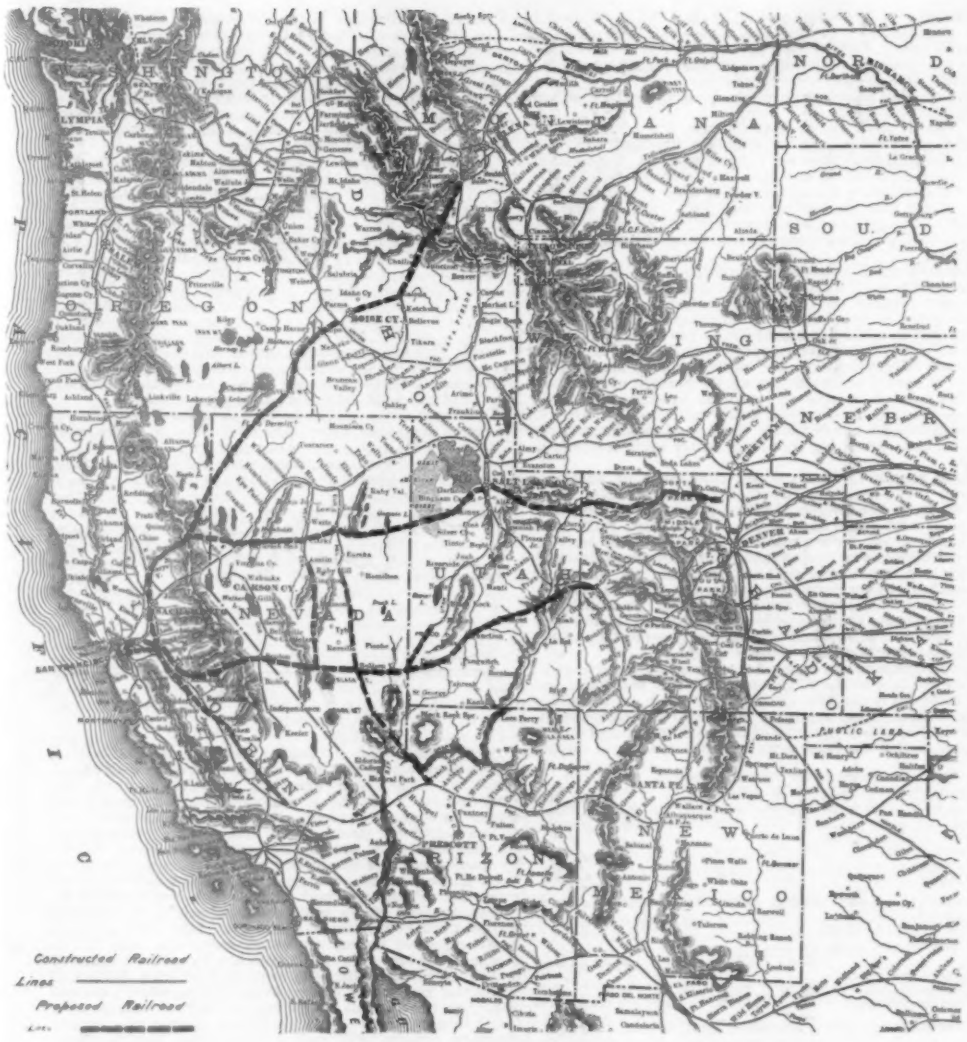


Fig. 7.



California as a Field for New Railroads.

wealth of one grand monopolistic power. The state has consequently failed to develop the full extent of its resources, has been unable to compete successfully with other markets, and is fully 10 years behind the times, in many respects, as compared with other localities having fewer natural advantages, but more adequate means of transportation and cheaper rates.

The young men of San Francisco have been gradually forced to appreciate the condition of affairs. Their own interests have begun to suffer, and are in a fair way to suffer more. They have become aroused, and the more progressive and energetic have formed themselves into an association for the young men of the state, and have called it the "Young Men's League of Progress." Their object is to give their aid and support and efforts to ameliorate the condition of business and politics, to promote and assist every enterprise that will benefit the state, to oppose concentrated control of the lines of transportation, and to bring about the construction of competing lines. The last two things they have particularly in view at the present time.

To any one who knows what railroads have done for other portions of the West, what important factors they are in the development of the latent resources of a country, and how well they pay when built, and who is acquainted with the territory west of the Rocky Mountains, or who will make a study of it, it will be plainly apparent what an immense field is untraversed by railroad lines, what rich districts could be opened up, and how greatly transcontinental business could be facilitated.

The map annexed shows several proposed lines that would be of immense benefit to California, the interior, and the country at large. They would all be paying lines. Along them would be mines of lead, coal, iron, gold, silver, copper and salt; immense forests abound, and agriculture and stock raising is carried on in the valleys. The line to the Northeast to Butte, Montana, connecting with the Northern Pacific and the Great Northern would place Minneapolis and St. Paul within more easy reach of the products of California. The line extending east through Central Nevada and Utah would be a competitive one to Salt Lake City, and if carried farther east into Colorado would give the Burlington & Missouri a western connection. The line east by way of Yosemite Valley to Junction City, Colo., would allow tourists to reach California's "Wonderland" by rail, and would give the Colorado Midland a through line to the coast, and perhaps be available to the Missouri Pacific and the Chicago, Rock Island & Pacific. The line south through central California is now reported under contract to be built. This will give the Santa Fe a through route to San Francisco. At present it uses the Southern Pacific from Mojave, which is the terminus of the Atlantic & Pacific.

All the lines proposed have been under consideration and most of them have been surveyed and found to be practicable, with lighter grades and requiring lighter curvature than the existing lines. Improved and modern methods of engineering will also make them superior to the old roads.

In addition to railroads San Francisco needs a bridge across the bay from Oakland. This is also within the realm of possibilities.

SAN FRANCISCO, July 10.

Sully's Freight Car Lock and Seal.

The engravings herewith show the construction of a seal for freight cars invented and patented by Maj. R. M. Sully, Superintendent of the Richmond & Petersburgh Railroad, at Richmond, Va. This device is an improvement on an earlier seal made by the same inventor and described in the *Railroad Gazette* of May 4, 1888. The distinguishing feature of this seal is the perforated

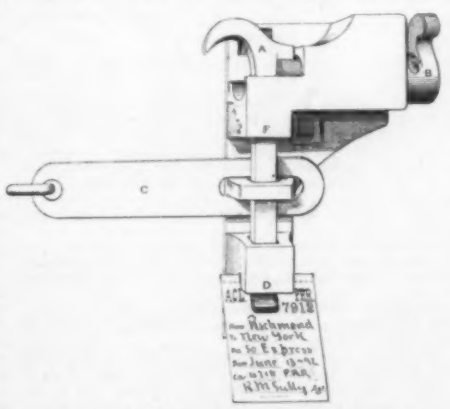


Fig. 1—Sully's Freight Car Lock and Seal.

tin tag, which is readily broken by bending along the perforated line when it becomes necessary to take it off, but which is protected while in transit by the iron parts around it. This tin has a paper face which, when filled out with pen and ink, constitutes the card manifest, so that a car is sealed and carded at the same time and in one operation; and old cards are sure to be removed at the proper time. As will be seen by the engraving, the practice on the Atlantic Coast Line, where these seals are used, is to number the cards, so that a complete record of them can be kept.

The operation of the device is very simple. To unfasten a car, the tag is torn out and the pin *A* can then be lifted and the hasp *C* pulled off from the staple. To lock the door, the pin *A* is first raised and the lever *B* is turned down and pulled to the right; this allows the pin *A* to drop so that its lower end is far enough below *D* to permit the tag to be hung upon the hook which forms the end of the pin. After the tag is attached the pin is lifted to the position shown, and the lever *B* is turned back and pushed to the left (to the position shown in fig. 1). The left hand end of its horizontal portion then engages with the lug on the upper end of the pin *A* and holds it there, and it is impossible to again pull out *B* because it is held by the small pin *E*, fig. 2, which is held down by a spiral spring. The pin *A* is then prevented from rising by the tin tag, and prevented from falling by the lock *B*. When, after breaking the tag, the pin *A* is raised, *B* can be withdrawn by turning it over so as to force the small pin *E* upward.

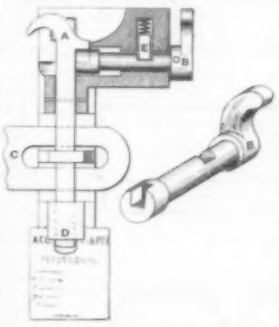


Fig. 2—Sully's Seal.

With this apparatus a car can be sealed without the aid of any press, lever or other instrument, and this advantage is secured without the use of glass, cast iron or other bulky seals. There is a perforation through the upper lug and the pin at *F* which permits the use of wire seals when the car is away from home.

This seal is well recommended by those who have used it, and well known experts pronounce it proof against tampering. Much of the trouble experienced with seal records in claim agents' offices is due to the doubtful character of the records. "Illegible," "blank," etc., are notations which cause more annoyance than those showing absolute loss, and these would seem to be well provided against in the Sully seal. If a tag is illegible reference must be had to the way bill for information on which to move the car, and then the seal record on the bill can be examined; and the number stamped on the tag, being large and plain, is very unlikely to be so obliterated as to destroy all clew to the identity of the car.

Design and Manufacture of Steel Cross-Ties.

A recent publication of the Institution of Civil Engineers (England) is a paper by Mr. H. K. Bamber on the manufacture of steel cross-ties. Mr. Bamber treats the subject from the standpoint of a manufacturer, having had the supervision of the execution of large orders. His purpose is to give information as to methods and requirements which will be of use to makers and designers of steel cross-ties, and he confines his paper to ties of the inseparable clip type and such as have passed beyond the experimental stage.

The sleepers of this type, which have so far given the most satisfactory results, are those designed by Sir A. M. Rendel, M. Inst. C. E., and Messrs. Cabry & Kinch. Both of these are suitable for use with flange rails, the rail-fastenings being formed by punching up a part of the material of the plate itself to form clips or jaws, in which the rail is held by steel taper keys. These clips or jaws are punched at such a distance apart that when the rail flanges bear against them, the desired gauge or distance between the rail heads is obtained, while the only separate part required is the taper steel key, which, being driven between the rail flange and the opposite jaw to that determining the gauge, forms a rail-fastening both simple and secure.

Fig. 1 represents the standard sleeper of this type, as used on the Indian State, Mexican and other railways of different gauges. The section at the rail seat illustrates the method of rail fastening as adopted on these sleepers.

Each rail has a bearing surface on the sleeper of 18 sq. in., and is held in position by the two jaws, the taper key being driven between the outer or inner jaw and the rail flange. These sleepers are made from rolled steel plates, the section of which is fish-bellied, or padded, that is, with a thickened part rolled down the centre; in both cases the thickness is usually about ⅝ in. along the centre, and about ½ in. at the edges.

The rolled plate is pressed to shape under dies, the jaws being punched. They are dipped at a temperature of about 300 deg. Fahrenheit in a boiling solution consisting of 3 parts coal tar and 1 part tar oil, which forms a good hard coating. It will be seen that the space between the edges of the jaws is less than the width of the

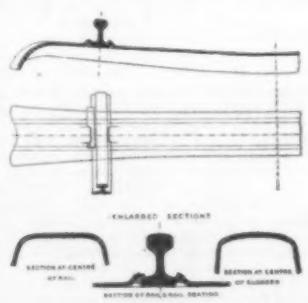


Fig. 1.

rail flange; it is therefore necessary to tilt the rail to put it into place. This has the disadvantage of preventing the removal of one sleeper independently of the rest in a length of rail, as, in order to remove one, the two rails must be uncoupled and taken off; on the other hand, the rail cannot leave a sleeper should the keys become displaced.

The details of Indian State sleepers of the standard type are:

Gauge. METRE.	Length of plate.	Width of plate.	Weight. Lbs.	Weight of two keys. Lbs.	Weight per mile. Tons.	Cwt.
	5′ 9″	12″	69	1.25	55	4
5′ 6″	8′ 9″	13½″	120	2.00	95	17

The manufacture of these sleepers forms a very large industry, one firm alone having manufactured up to the present time a total quantity of 130,000 tons, or 2,800,000 sleepers, and the firm above mentioned can turn out finished sleepers of the metre gauge at the rate of 10 a minute.

Sleepers similar to that shown by fig. 2, as designed

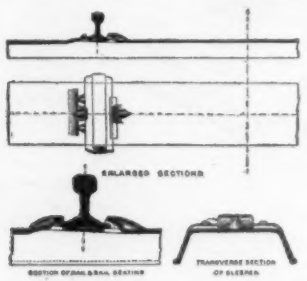


Fig. 2.

by Messrs. Cabry & Kinch, of Darlington, were put down experimentally on the North Eastern Railway in 1887. This sleeper is of inverted trough section with open ends, having a narrow flange or rib rolled along its lower edges, which stiffens the plate, but it is not wide enough to interfere with the proper bedding of the sleeper in the ballast, as was the case with the old sleepers of the Vautherin type.

The clips of this sleeper are formed by hydraulic pressure entirely out of its own substance, as in the case of the Indian State sleeper. Both the inner and outer clips of this sleeper have their backs buckled or corrugated, which considerably increases their stiffness. The sleeper is also furnished with two studs, or what may be called "rudimentary clips," punched up, one on each side of the outer clip, in the same manner and at the same time with the clips proper. These two studs, being slightly nearer the rail flange than the root of the outer clip, relieve the clip of nearly all thrust, its office then being chiefly to keep the rail down. The outer clip is 2½ in. wide and covers the rail flange for ⅝ in.; the inner clip is 3½ in. wide and covers the rail flange for ⅜ in., the steel taper key being driven between this clip and the rail flange. The keys are 8 in. long and have a taper of about 1 in 64. These sleepers, however, can only be keyed on the inside, and therefore the gauge cannot be widened except by the use of special sleepers.

The rail is placed in position by tilting it and passing one side of the flange under the inner or longer clip, sufficient space being left for the outside of the flange to clear the shorter clip. It is then dropped on to the rail seat and slid back under the shorter clip, and the steel taper key is inserted between the rail flange and the longer clip. It will be seen that the flange is overlapped by both clips, and that the rail cannot be forced out of position, even should the keys be displaced.

The details of this sleeper are:

Gauge.	Length of plate.	Width of plate.	Weight. Lbs.	Weight of two keys. Lbs.	Ozs.	Weight per mile. Tons.	Cwt.
4′ 8½″	8′	16″	150	31	2¾	132	5

It has been found that the steel taper keys, when once driven tight, do not slack back, and their small ends are therefore no longer split, which greatly lessens the cost of their manufacture. As regards the length of life of these sleepers nothing can yet be said with certainty, as they have only been in use since 1887, but the author is informed that there has as yet been no failure of the clips. Another form of sleeper of "inseperable clip" type, but one which has perhaps not yet been brought prominently before the engineering world, is that introduced by Mr. Riley, of the Steel Company of Scotland, in 1885, and used to some extent on the North Eastern Railway. The peculiarities of structure of these sleepers are shown by figs. 3 and 4. They are made by

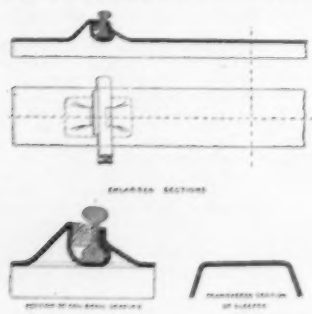


Fig. 3.

rolling the section thicker at the part destined to receive the rail, and by thrusting the ends of the plate together so as collect sufficient material to form the jaws. Both the inner and outer clips are first pressed into the form of the outer, and the inner is then forced into the shape shown by the use of special dies. Provided the metal of which these sleepers are made is of a sufficiently mild quality, and worked only at a proper heat, they might be successfully used; but it appears to the author that, unless these conditions were rigidly adhered to, the amount of strain set up by cold working would be such as to cause the number of defective plates to be very great.

Fig. 4.

Steel to Be Used.—The quality of the steel to be used in the manufacture of sleepers, whose rail fastenings are formed out of, and are in a piece with, the sleeper itself, is of the utmost importance, and steel makers have had to study this matter very carefully.

The special requirements of sleeper steel at present are:

1. That it shall be as even as possible in quality. 2. That it shall withstand an ultimate tensile stress of at most from 26 to 21 tons per square inch. 3. That it shall elongate at least 20 per cent. in a length of 10 in. 4. That it shall show a contraction of area at point of fracture of not less than 40 per cent. 5. That it shall be capable of being bent double on itself to an inside radius of one-half its mean thickness, without sign of crack or fracture.

The steel used possesses the qualities of homogeneity, malleability and ductility. The first of these qualities depends largely on the proper mixing of the steel, effected either by means of a mechanical stirrer, which is lowered into the ladle containing the metal which has just been run from the converter, and made to revolve at about 100 revolutions per minute, or by blowing the metal at such a temperature as to permit of its being poured from the converter into an intermediate ladle, thence into the casting-pit ladle, and finally into the ingot molds, in a sufficiently fluid condition, which can only be done when pig iron sufficiently high in silicon is used.

There seems to be no doubt that want of sufficient mixing is the reason why sometimes, in a dozen sleepers cut from one length of rolled plate, all having been punched with equal care, some of the clips fail under the bending test before reaching an angle of 90 degrees, while others can be bent double and hammered down on the back of the sleeper without fracture. It has been the author's experience that this want of regularity of quality is greatest when the metal, after the addition of the manganese, is perhaps blown again for a few seconds, and not afterward mechanically mixed by either of the two methods above mentioned.

The analyses of the class of steel used by the five chief sleeper makers in the kingdom, and the results of tensile tests showing the quality and range of each, are given below. The analysis in each case corresponds with the "medium" quality of the steel given under each number, and the tensile tests, which were made during

ANALYSIS OF "MEDIUM" STEEL.

Number	1	2	3	4	5
Process of manufacture..	Acid.	Acid.	Acid.	Basic.	Basic.
Carbon	0.13	0.12	0.12	0.09	0.11
Silicon	0.03	0.01	0.02	nil	0.02
Sulphur	0.06	0.06	0.05	0.05	0.05
Phosphorus	0.06	0.06	0.05	0.06	0.05
Manganese	0.40	0.40	0.70	0.42	0.75

RESULTS OF THE TENSILE TESTS OF THESE STEELS.

Quality	"Medium."				
Load per square inch, tons	30.41	27.38	27.31	28.39	29.90
Elongation per cent. in 10 inches	23.00	26.50	21.56	21.50	23.00
Contraction per cent	46.00	56.00	not taken	not taken	48.00

the execution of orders, represent hundreds of thousands of tons of steel. It will be understood that the terms "soft," "medium," "hard," are used relatively, for the purpose of showing the range and averages of the different steels.

In order to show that steel of a higher tensile strength than 31 tons is not suitable for use in the manufacture of these sleepers, the author gives the analyses and the results of tensile tests of steel, taken from the backs or thickest parts of some sleepers which had broken in two by falling on a hard substance when being discharged from railway wagons:

The lesson to be learnt from these experiments seems to be that steel having a tensional strength of 32.25 tons per square inch is not suitable for use in the manufacture of sleepers which have to withstand strains caused by the punching up of portions of the plate, because by working the steel at too low a heat strains may be set up by the subsequent operation of punching, to such an extent as to cause fracture, as in the cases just considered. It is the author's experience that, if in the ordinary course of manufacture, the steel be kept at about 28 tons tensile strength per square inch, the clips may be bent double without any fear of fracture taking place; but when of such tensile strength as to withstand 31 tons per square inch, at least 4 per cent. of the clips will fail on being bent to an angle of 90 deg. He is, therefore, of opinion that steel used in the manufacture of sleepers of this type should be allowed to range between 26 and 30 tons, and he finds that the steel which gives in all respects the most satisfactory results is that which answers to the following analysis and tests:

Analysis. Per cent.		Tensional strength. Tons.
Carbon	0.12	Load per square inch. 28.00
Silicon	0.02	Elongation per cent. in 10
Sulphur	0.05	in. 24.00
Phosphorus	0.05	Contraction per cent 50.00
Manganese	0.70	

The steel should be capable of being bent double on itself to an inside radius of one-half its mean thickness, without sign of lamination, crack or fracture.

Manufacture.—In designing a steel sleeper there are questions to be borne in mind no less important than that of the absolute perfection of the design. These questions are:

1. What process will the carrying out of this design involve?

2. How far will these processes be more costly than the value of any peculiarities of the design in question warrants? How far can uniformity of results be relied upon?

There are two methods of rolling steel sleeper plates—1. Into the form of flat plates. 2. Into the form of trough-shaped plates.

In the first case, for sleeper plates 13½ in. wide, the section of ingots at about half their length measures 10 in. × 17 in.; while in the second case, the section at the same point is 15 in. square. In either case the weight of the ingot varies from 20 to 30 cwt. The important point to be remembered, in the rolling of soft steel into thin and narrow plates of great length, is that the metal, unlike hard steel or iron, on being rolled, does not tend to spread in the direction of the width of the plate; and therefore the ingot should always be wide enough to permit of a sufficient amount of compression on the sides which will ultimately form the edges of the plate.

A plate, such as used in the manufacture of the sleeper shown by fig. 1, will be rolled in the following manner. The ingot measures 10 in. × 17 in., and the first operation consists in cogging this ingot down to a section measuring 2½ in. × 14 in., fig. 5. It will be seen that compression to the extent of 7½ in. has thus taken place in the direction of the thickness of the plate, and 3 in. in that of its width; the latter being effected by turning the ingot (which now measures 2½ × 17 in.), and passing it through an "edging groove," whose cross section is 2½ × 14 in. This passage through the "edging groove" is the great feature in securing sound flat plates, and before ingots were compressed in this manner it was almost impossible to obtain a length of plate which was perfectly sound on its edges.

The sleeper shown by fig. 1 may also be made from plates rolled in trough form, in which case the ingot would measure 15 in. square, and would be cogged down to a section measuring 8 × 6½ in., as shown by fig. 5, a compression respectively of 7 and 8½ in. The advantage to the sleeper maker of rolling plates in trough form is that the same ingot molds and cogging rolls may be used as for rails, whereas special molds and cogging rolls have to be used for flat plates, unless the rolls have been designed for both rail and sleeper ingots.

Fig. 5.

The ingot from which the trough shaped plates are to be rolled measures after cogging 8 × 6½ in. at its cross-section. This ingot, or rather slab, when reheated, is passed through the roughing rolls and compressed, assuming in turn the sections shown in figs. 6.

Fig. 6.

Steel sleeper plates, both of flat and trough section, are shaped while red hot under a hydraulic or steam press, to which are attached suitably shaped cast iron molds. Of these molds, that forming the under or concave part of the sleeper is usually fixed to the bed of the press, while the upper block is bolted to the top table, which in turn is attached to the hydraulic ram and is movable vertically, the ends of the table sliding in grooves cast in the standards of the machine. Formerly the bottom block was cast in two pieces, so that, if one end failed, it might be replaced without removing the whole block. This arrangement, however, gave rise at times to serious defects in the sleepers, for however tightly the blocks might have been bolted to the machine, the repeated shocks sustained when the heavy top block descended invariably caused the two halves to be moved out of line, marking the sleepers very badly; indeed, sometimes nearly shearing them in two where the blocks met. The top block or mold may with advantage be cast in two pieces, and these should not be too rigidly fixed to the machine, as they readily adjust themselves to the plate which is being pressed; and in the case of trough-rolled plates, the thickness of whose sides often varies very considerably, this is a great advantage, as it relieves the ram of much of the side pressure brought on it by such irregularities of thickness.

The Clip.—The most important of all the operations which take place in the construction of steel sleepers of the "inseparable clip" type is that of the formation by punching of the clips or rail-fastenings. The life, and therefore the value of the sleeper itself, depends upon the strength of these fastenings, while the accuracy of gauge, or distance between the rails, is determined by their proper relative position. It is well known that if steel is punched either cold or at a low heat, the metal surrounding the punched portion is very injuriously affected; but that if annealing is afterward resorted to, the trains set up in punching are to a certain extent removed.

Unfortunately it is not possible to anneal an article of irregular form and section, without its becoming distorted in cooling to such an extent that the amount of after adjustment required precludes the possibility of the cheap and rapid manufacture of such an article. For this reason, steel sleepers cannot advantageously be punched cold and afterward annealed. The only alternative, then, is to form the rail-fastening while the sleeper plate is at a good red heat, and to complete the manufacture of each sleeper before its temperature has fallen to anything like a black heat. In punching sleeper plates at a red heat, two difficulties present themselves; the first being that of maintaining a proper relative position between the fastenings, owing to the irregularity in the contraction of plates, either from the quality of the metal or variation of temperature at the time of punching; secondly, there is the difficulty of keeping the punches and dies, which constantly come in contact with the red hot metal, sufficiently cool to insure keen cutting edges, without lowering the temperature of the sleeper itself in the neighborhood of the jaws.

Before dealing with these difficulties, the author proposes to give the results of experiments which he carried out on a large number of sleepers, with the view of ascertaining the most suitable temperature for the formation of rail fastenings of the type used on Indian State railways. The steel used in these experiments was uniform in quality, and of equal tensile strength.

1. Of clips punched in cold plates, 100 per cent. broke off short on being bent back with the usual testing spanner through an angle of 10 deg. 2. Of clips punched in cold plates which were afterward annealed, 50 per cent. broke off at an angle of 20 deg., while 50 per cent. broke off at an angle of 90 deg. 3. Of clips punched in plates which had been heated to a bright cherry red and allowed to cool down to a black heat before being punched, 66 per cent. broke off short, while the remainder failed before reaching an angle of 30 deg. 4. Of clips punched in plates at a black heat and afterward annealed, 91 per cent. bent back double on themselves, while the remainder stood at an angle of 90 deg. before breaking. 5. Of clips punched in plates at a cherry-red heat, all clips bent back double, while the result of tests made on plates punched at a red heat and afterward annealed was equally satisfactory.

These experiments show very clearly the danger of forming the rail fastenings on a sleeper plate which has become too cold before reaching the pumping machine, and the absolute necessity of punching the metal while at a good red heat.

Given the proper temperature, there are two methods

of forming the rail fastenings in a sleeper, each having its advantages. In the first, or direct, method, the clips are punched at once to their proper position, while in the second, they are punched deeper, and are afterward brought back to their proper position by being hammered on to suitably shaped pieces of metal called drifts. The first is far the cheapest method, and, provided everything is satisfactory, results in a good job; but, unfortunately, the quality of metal, condition of punches and dies, and temperature at time of punching, are constantly varying, and it is the author's experience that clips formed by the second method, which insures a sufficient root to the clip and the removal of fins or burs left by blunted punches, are the most uniform and satisfactory both as regards strength and finish.

Returning now to the actual manufacture of a sleeper; on leaving the press, where it has assumed the required shape, it is immediately taken to the punching machine, turned on its back, adjusted to position, and the clips punched down, the latter being either drifted or not, according to method of manufacture adopted.

Some manufacturers secure accuracy of gauge in the sleeper by making distance marks on the sleeper plate, and by blowing steam on to it until these marks trammel correctly, when the clips are at once formed, or, if the distance marks are found to be near each other, the temperature of the plate is raised and the gauging again tested. Others again judge by practice the proper heat, and although from time to time, through carelessness, variations of gauge may arise, with proper care and attention on the part of the workmen the gauge is sufficiently accurate for all practical purposes. About $\frac{1}{16}$ in. total variation is allowed by the terms of the specification, but the author has noticed that platelayers make short work of adjusting a sleeper which is either $\frac{1}{16}$ in. too wide or too narrow to gauge. The most satisfactory method of keeping the punches and dies cool without injuring the sleeper plates themselves, is one in which jets of water impinge on the punches and drain on to the faces of the dies before running to waste. The water is started and stopped automatically by the rise and fall of the punches, the motion of which opens and closes the stop-cocks. As soon as the punches begin to descend, the water is cut off, and does not flow again until the punches have cleared the plate. It has been found that by cooling the punches and dies in this manner, a saving of 60 per cent. is effected in the wear of the tools, while the advantage to the jaws of the sleepers is equally great.

In conclusion, the author makes the following suggestions as regards the manufacture of steel sleepers: 1. That the steel used in sleeper manufacture should not be of a higher tensile strength than 30 tons per square inch. 2. That tensile tests of the steel used should be made as often as possible; this test being the surest guarantee of the after behavior of the metal in punching. 3. That sleeper plates should be rolled in the flat form in preference to the trough. That, when possible, the sleeper should be pressed and punched immediately on leaving the rolls, care being taken that only such a number of plates are pressed as will insure the last being at good heat after leaving the punching machine. 5. That the sleepers should in no case be dipped in tar at such a temperature as to give rise to thick yellow fumes. 6. That at least 2 per cent. of the rejected sleepers should be tested and 3 per cent. weighed separately daily.

Machine for Lining Brasses with Soft Metal.

The engravings show a machine for lining brasses with soft metal that is used at the West Milwaukee shops of the Chicago, Milwaukee & St. Paul Railway. It consists of a cast iron table, figs. 1 to 3, 1 ft. 6 in. × 1 ft. 6½ in. high. On the top of this table is a slot fitted to receive a mandrel corresponding to the size of journal for which the brass is to be lined. The mandrel is held in position with a taper key, *A*, figs. 1 and 3. The table carries a pair of guides, in which works a crosshead that supports a clamp or slide fitting over the mandrel. An extending yoke, shown in figs. 1 and 2, carries a hand wheel with a brass bushing fitted to a screw permanently attached to the main table. The crosshead acts as a vise by which the brass is clamped against the enlarged end of the mandrel. The soft metal lining is poured into the space between the mandrel and brass. In order to keep the mandrel cool a current of water flows into it through an iron pipe fitted into the mandrel, which is drilled hollow to receive it. A drip pipe with a plug cock controls the flow of water. The details of construction are clearly shown by the engravings. A guide block is placed on one side of the mandrel and bolted to the table to fix the position of the brass sideways. The machine is adjustable to the various sizes of brasses.

Fig. 1.

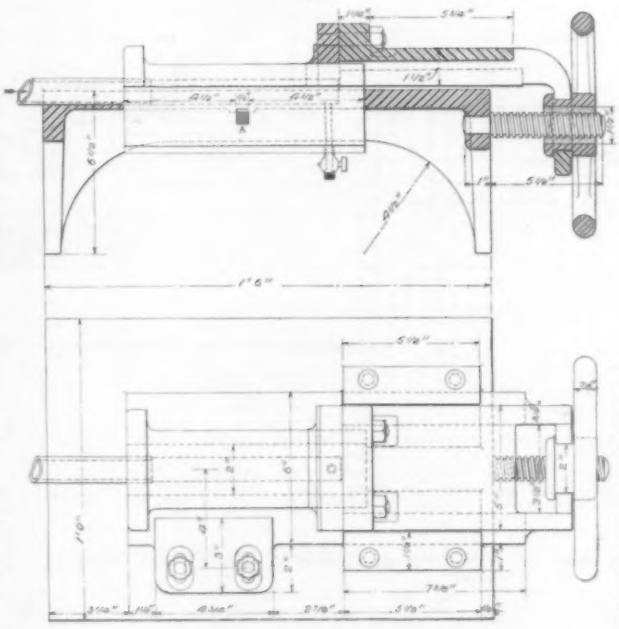


Fig. 3.

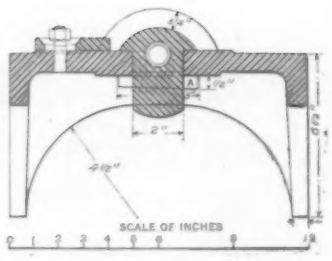


Fig. 2.

Machine for Lining Brasses with Soft Metal—Chicago, Milwaukee & St. Paul Railway.

Train Accidents in the United States in June.

COLLISIONS.

REAR.

4th, 1 a. m., on Atchison, Topeka & Santa Fe, near Lawrence, Kan., a freight train broke in two, and when the foremost part of it slackened for a crossing the rear portion ran into it, wrecking five cars. Two tramps were killed.

10th, 2 a. m., on New York Central & Hudson River, near East Albany, N. Y., a freight train broke in two, and the rear portion afterward ran into the forward portion, wrecking 11 cars. One brakeman and four tramps were injured.

11th, on Pittsburgh, Ft. Wayne & Chicago, at Rochester, Pa., a west bound express train, drawn by two engines, collided with an excursion train, which, it is said, failed to get a flag out in time. Three engines and a baggage car were badly damaged, and 2 engineers and 1 fireman injured.

12th, on Staten Island Rapid Transit at Stapleton, S. I., N. Y., a passenger train which had just stopped at the station was run into at the rear by a following passenger train, damaging the rear car and throwing one truck off the track. Both trains were crowded with passengers and a number of men and boys in the foremost train climbed out of the windows, and a panic ensued. Four passengers were injured and a large number were cut by broken glass. The engineer of the second train seems to have been careless in applying the brakes.

13th, on Boston & Maine near Groton, Mass., a passenger train ran into the rear of a freight, wrecking 2 freight cars, which with the passenger engine were set afire and all of the combustible portions burned up. The passenger engineer was killed. The freight train had broken in two.

14th, 1 a. m. on Baltimore & Potomac at Halethorpe, Md., a freight train ran into the rear of a passenger train wrecking the engine, 1 sleeping car and 4 freight cars. Two passengers and 2 men stealing rides on the freight were injured. The passenger train had broken in two and the rear portion stopped immediately after passing a block signal station, and the freight approached this at uncontrollable speed.

21st, on Pennsylvania road, near Bryn Mawr, Pa., rear collision of freight trains making a bad wreck and injuring 3 trainmen.

22nd, 4 a. m., on Missouri, Kansas & Texas near Denison, Tex., a freight train which became stalled in ascending a grade was run into at the rear by a passenger train, the runner of which failed to observe a red signal. There was a car of oil in the freight train, and the caboose, 2 freight cars, baggage and mail car were burned up, together with the combustible portion of the locomotive. Three trainmen were injured.

22nd, on Fitchburg road near Athol, Mass., a west bound passenger train ran into the rear of a preceding freight wrecking 10 freight cars, 4 of which took fire and were burned up. The passenger engine was badly damaged. The freight conductor was injured.

24th, on Baltimore & Ohio near Farmington, W. Va., a passenger train ran into the rear of a preceding freight train. Engineer, fireman and mail agent injured.

25th, 12:30 a. m., on Pennsylvania road at Harrisburg, Pa., west bound passenger train No. 9, which had been stopped a short distance east of the station, was run into at the rear by the second section of the same train, badly wrecking 3 passenger cars of the first train, and the engine and baggage car of the second. Twelve passengers were killed and 23 injured. The second train ran past a block signal which was at danger, at uncontrollable speed, and the collision occurred about 180 ft. west of the signal, the foremost train having just started. This accident was reported in the *Railroad Gazette* of July 1.

29th, on St. Louis Southwestern at Altheimer, Ark., a passenger train standing at the station was run into at the rear by a freight, which approached at uncontrollable speed, wrecking the two rear cars. Three passengers were killed and 7 injured.

And 18 others on 11 roads involving 4 passenger and 26 freight and other trains.

BUTTING.

3d, on Little Rock & Fort Smith, near Preston, Ark., butting collision of freight trains, wrecking both engines and 20 cars. A brakeman was injured and two men stealing rides were killed.

4th, on Chicago, Milwaukee & St. Paul, near Western Union Junction, Wis., butting collision of freight trains, wrecking both engines and 12 cars. Three trainmen were injured. The southbound train ran past the station, where it should have stopped. The operator claimed that the signal was set at danger and the engineman that it showed all clear.

5th, on Louisville & Nashville, near South Carrollton, Ky., butting collision between a regular and an extra passenger train, wrecking both engines and partially wrecking the foremost cars in both trains. In the excursion train 4 passengers were killed and 40 injured, and in the regular train 3 were injured. The fireman of the excursion train was killed. The excursion train ran past a meeting point. A new time table was issued to take effect at 7 p. m. June 5. This time table was in possession of the conductor and engineer of the excursion train and they had signed for it in the book provided for that purpose, which stated that the table took effect at 7 p. m. June 5, but they made a mistake in reading it and thought it took effect at 7 a. m. On the new table train No. 2, the train with which this collided, was due at South Carrollton 9.37 a. m., but on the old, which was still in effect, at 9.20 a. m. No. 2 left South Carrollton at 9.22 and collided with the excursion train 1¼ miles north of South Carrollton at 9.25.

10th, on Louisville, New Orleans & Texas Pacific near Days, Miss., butting collision of freight trains, making a bad wreck and blocking the road the whole day. One fireman was killed and 6 other trainmen injured.

11th, on Missouri, Kansas & Texas near South Canadian, I. T., butting collision of freight trains, making a bad wreck and killing many head of cattle. The fireman of one of the trains was killed.

13th, on New London Northern, at South Windham, Conn., butting collision between a freight and a passenger train, badly damaging both engines and the front portion of both trains. The passenger conductor was injured. The freight was preparing to back into the side track, but pulled too far forward without sending a signal in advance.

15th, on Sioux City & Northern, near Manley, Minn., butting collision between a south bound passenger and a north bound freight train damaging engine and 4 cars. The freight train had been given until 4.45 a. m. to reach Manley, but it is said that the operator wrote the message "5.45."

17th, on Pennsylvania road, at Charleroi, Pa., a passenger train ran over a misplaced switch and into the head of a work train standing on the side track, badly damaging both engines. Conductor, brakeman and 2 passengers injured.

18th, on Norfolk & Western, at Dublin, Va., a west bound passenger train collided with an east bound freight, wrecking the engine and baggage car. The fireman of the freight was killed and the engineer and two mail clerks badly injured.

19th, on Union Pacific, near Valverde, Col., butting collision between a train of empty passenger cars and a switching engine drawing two freight cars, wrecking the whole of the freight train and the engine and 2 cars of the passenger train. It is said that the switching engine was running on the time of the other train.

21st, on St. Paul & Duluth, near Stillwater, Minn., butting collision between a St. Paul & Duluth and a Wisconsin Central passenger train, the first-named train having failed to wait at the appointed meeting point. Both engines and one passenger car were badly wrecked and the baggage car overturned. A boy riding on the engine was killed, and 6 trainmen and 3 passengers were injured. It is said that the conductor failed to carefully examine the train register, from which he should have learned that the other train had the right to the track over which he was to pass; but it also appears that the operator *had filled out the train register* for the train in question, all except the time, entering the conductor's and engineman's name and the notation "no signals."

22d, on St. Louis & San Francisco, near Brush Creek, Mo., butting collision between a passenger train and a freight, making a bad wreck. A fireman was killed and 5 other trainmen injured.

23d, on Evansville & Indianapolis at Brazil, Ind., butting collision between a passenger train and a freight, 2 passengers being injured.

26th, on New York, Ontario & Western, near Phillipsburgh, N. Y., butting collision between a south-bound milk train and an empty engine running north, wrecking both engines and 2 cars. Both firemen were killed and 3 other trainmen injured. It is said that the runner of the empty engine forgot about the milk train, though it appears that he had a conductor with him.

29th, on New York Central & Hudson River road at Poughkeepsie, N. Y., a south bound express train ran over a misplaced switch and into a switching engine standing on the side track, doing slight damage. Five passengers was injured.

And 6 others on 6 roads involving 3 passengers and 9 freight and other trains.

CROSSING AND MISCELLANEOUS.

1st, on Connecticut River road at Northampton, Mass., a switching freight train ran over a misplaced switch, and into the side of a passenger train just approaching the station, wrecking the sides of 3 passenger cars. A passenger standing on the rear platform was killed.

1st, on Western Maryland at Finksburg, Md., a passenger train which was placed on a side track to meet an express, was not moved fully clear of the main track and was struck by the other train, the rear car being overturned. Three passengers were injured.

1st, on Pennsylvania road near Broad Street Station, Philadelphia, a locomotive ran into a parlor car, overturning it and blocking all the tracks leading to the station for an hour. Trains were disarranged for 7 hours.

3d, on Chicago, Burlington & Quincy near Colchester, Ill., collision between a freight and a work train causing the death of 1 trainman and 1 laborer, and the injury of 4 other employés.

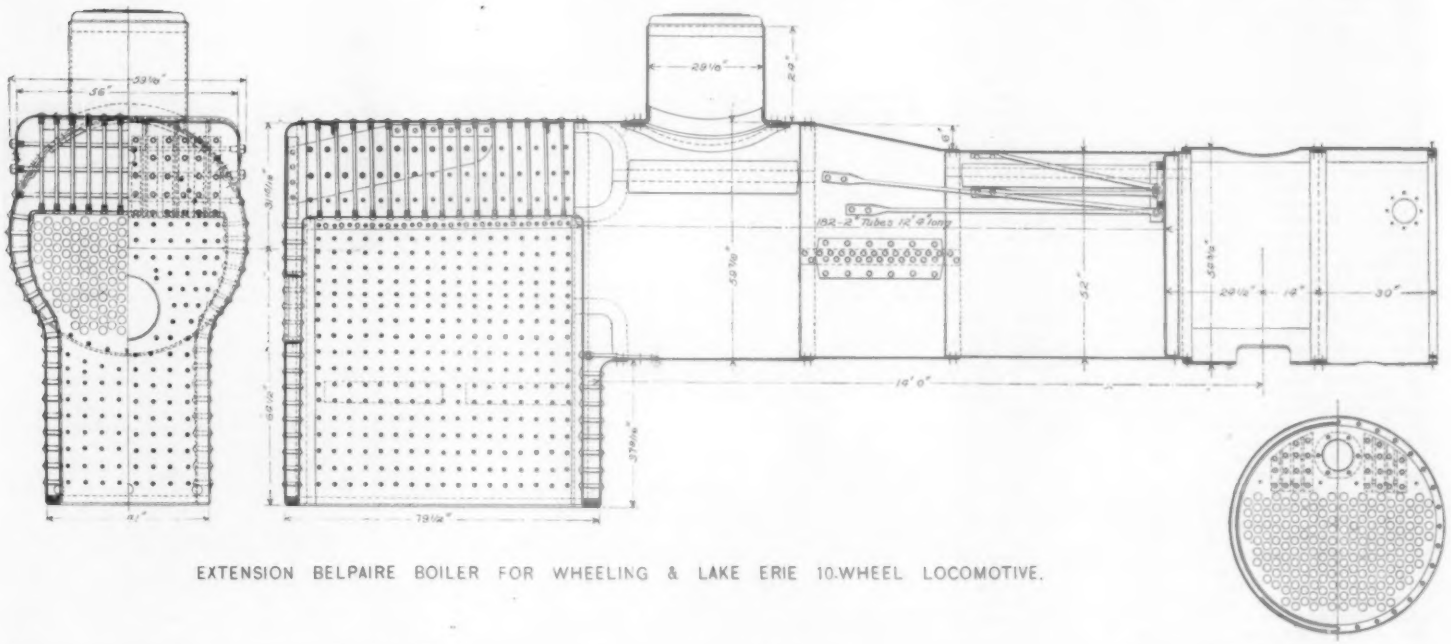
10th, on Pennsylvania road at Parksburg, Pa., collision between an express and a local passenger train damaging both engines, and injuring both engineers.

15th, on Philadelphia & Reading at Oreland, Pa., a passenger train ran into a switching freight which had failed to clear the main track at the proper time, overturning the first car, and injuring 4 passengers. The engineer of the passenger train was killed, and the fireman badly injured. The engineer of the freight could not be found after the collision.

16th, 1 a. m., on the Terminal railroad of St. Louis, at Twelfth street, St. Louis, two switching freights ran together sidewise at a point where a switch had been misplaced, and knocked down an important overhead bridge.

20th, on Philadelphia & Erie, near Sterling Run, Pa., collision between a freight and work train. Twenty employés were injured.

27th, on Boston & Maine, at Malden, Mass., a northbound express train ran into the engine of a preceding



EXTENSION BELPAIRE BOILER FOR WHEELING & LAKE ERIE 10-WHEEL LOCOMOTIVE.

(way) passenger train which was just backing into the side track to clear the way for the express. Both engines were badly damaged and the boiler of one of them exploded. One engineer and 1 fireman injured. The foremost train was empty, but in the other several passengers were injured by flying glass. It appears that the conductor and brakemen of the way train were not familiar with the road, and did not take sufficient care in signaling the express.

And 15 others on 14 roads, involving 8 passenger and 20 freight and other trains.

DERAILMENTS.

DEFECTS OF ROAD.

5th, on Burlington & Missouri River road, near Indianola, Neb., eastbound passenger train No. 2 was derailed by a broken rail, 4 sleeping cars being partially overturned. The train was running at considerable speed, but only 1 passenger was injured.

7th, on Union Pacific, near Norfolk, Neb., passenger train derailed by spreading of the rails, wrecking the cars badly. It is said that the train was running about 60 miles an hour.

11th, on Pittsburgh & Western, near Youngstown, O., the locomotive of a freight train was derailed by spreading of the rails and overturned into the river. Conductor and 1 brakeman killed and 3 other trainmen injured.

22d, on San Antonio & Aransas Pass, near Wallis, Tex., a passenger train was derailed at a bridge which had been weakened by a freshet, the engine being overturned. The engineer was injured.

22d, on Cleveland, Cincinnati, Chicago & St. Louis, near Berrien Centre, Mich., a south bound passenger train was derailed by spreading of the rails, and the passenger car was overturned into the ditch. Of the 14 passengers 13 were injured.

24th, on Wabash road, near Mexico, Mo., a freight train broke through a bridge and the engine and 11 cars fell into the creek 50 ft. below. One train man was injured.

26th, on Pittsburgh, Fort Wayne & Chicago at Valparaiso, Ind., an eastbound express train was derailed by a defective switch when running at 40 miles an hour, 4 cars and the engine being thrown down a bank. The wreck was a bad one and the fireman was killed. The engineer and 6 other trainmen and 5 passengers were injured. The switchrail was loosened by the breaking of a wrought iron lug, in which an old flaw was afterward discovered. The switch was less than a year old.

28th, on New York Central & Hudson River road at the Grand Central station, New York City, an incoming passenger train of the New York, New Haven & Hartford was derailed just after the locomotive had been detached, preparatory to flying the cars into the station. The smoking car was partially overturned, but no person was seriously injured. It is said that the derailment was caused by a broken rail.

30th, on Savannah, Americus & Montgomery near McDade's Tank, Ala., the locomotive of a work train was derailed at a defective joint and fell down a high bank. A brakeman was killed by escaping steam and engineer and fireman were badly injured.

And 3 others on 3 roads involving 2 passenger trains and 1 other.

DEFECTS OF EQUIPMENT.

None under this head, except those which harmed no person; of these there were 12, on 10 roads, involving 12 freight and other trains.

NEGLIGENCE IN OPERATING.

26th, on Montana Central, near Elk Park, Mont., a freight train became uncontrollable on a steep grade and 9 cars were derailed, causing the death of a brakeman.

27th, on Central of New Jersey, near Tamaqua, Pa., a passenger train was derailed by a misplaced switch and the engine and baggage car went down a bank. Engineer, fireman and brakeman injured.

And 12 others on 9 roads, involving 6 passenger and 5 freight and other trains.

UNFORESEEN OBSTRUCTIONS.

2d, on Chicago, Burlington & Northern, near Dubuque, Ia., the engine of a freight train was derailed at a washout and overturned into the river. The fireman was fatally injured.

2d, on Allegheny Valley road, near Foster, Pa., a passenger train ran into a landslide, and the engine and baggage car were overturned and went into the Allegheny River. Five trainmen were injured.

7th, on Chicago, Milwaukee & St. Paul, at Hartford, Wis., a freight train was derailed by a washout, several cars being wrecked. Engineer, fireman and 1 brakeman killed.

8th, on the Southern Pacific, near Alvarado, Cal., a eight train was derailed by running over some horses, the engine being thrown down a bank. Several cars fell upon it, and the wreck took fire and was partly burned up. Engineer and fireman injured.

11th, on Northern Pacific, near Newaukum, Wash., northbound passenger train No. 4 derailed by running over a cow, the engine being overturned. Engineer and fireman injured.

13th, on Union Pacific, near Sunset, Col., a passenger train was derailed and the whole train, consisting of an engine and 2 cars, was overturned and thrown down a bank. There were but 10 passengers on the train, of whom 7, with the engineer and conductor, were injured.

13th, on the Burlington & Missouri River road, near Deadwood, S. D., engine and several cars of a freight train derailed by a land slide. Engineer and fireman killed.

17th, on Illinois Central, near Galena, Ill., freight train derailed by running into a washout, 20 cars being thrown down a bank. Engineer killed and 3 trainmen injured.

18th, on Chicago, Burlington & Quincy, near Gladstone, Ill., a work train was derailed by running over some cattle, and the engineer and 4 workmen were killed. The platform cars in the train were empty and made a very bad wreck, injuring 25 men.

23d, on Cornwall & Lebanon, near Mt. Gretna, Pa., engine of a freight train was overturned at a point where the track had been washed out, and the engineer and fireman were badly injured.

23d, on Illinois Central, near Plato, Ill., a westbound passenger train was derailed at a point where the track had been weakened by a flood and the two rear cars, which contained about 50 passengers, and which remained on the track, had to be left in a cut, surrounded by water, all night. The passengers could not get away except by boats and were compelled to live chiefly on crackers for a day or two.

29th, on Chicago & Alton, near Winona, Ill., a freight train was derailed by running over a cow, and the engine and several cars were ditched. Engineer killed and fireman injured.

30th, on Philadelphia, Wilmington & Baltimore, near West Chester, Pa., a passenger train was badly damaged by a tree which had fallen across the track, the conductor and several passengers being somewhat injured. The engine cut through the tree, but the limbs broke many of the windows in the cars.

And 6 others on 5 roads involving 1 passenger and 5 freight and other trains.

UNEXPLAINED.

2d, on Delaware & Hudson Canal Co.'s road near Hydeville, Vt., southbound passenger train No. 4 was derailed, 1 passenger car being overturned and thrown down a bank. The conductor was killed and 7 passengers injured.

6th, on Manhattan Elevated road, Second Avenue line, near Sixty-fifth street, New York City, passenger train derailed.

6th, on Alabama Great Southern, at Cuba, Ala., freight train derailed, the engine and four cars being wrecked. A brakeman was killed and the engineer injured.

9th, on Houston, East & West Texas, at Milam, Tex., a freight train was derailed, 2 cars and the tender being thrown into the ditch. The engineer was injured by jumping.

11th, on Mobile & Ohio, at Stonewall, Miss., a freight train was derailed and engineer and conductor injured.

13th, 3 a. m., on Pennsylvania road at West Philadelphia, a car in a stock train was derailed and ran against the support of an overhead bridge, causing the fall of the bridge, which was a large and heavy iron structure

12th, 7 a. m., on Southern Pacific near San Rafael, Cal., the engine and 1 car of a passenger train were derailed. Engineer, fireman and 1 passenger killed.

14th, 2 p. m., on Knoxville, Cumberland Gap & Louisville near Middlesborough, Ky., a freight train consisting of an engine and 16 loaded cars was derailed on a high trestle and the whole fell to the ravine below, making a horrible wreck. Three train men were instantly killed, 4 fatally injured and 6 less severely hurt.

15th, on New York, New Haven & Hartford, at Hartford, Ct., a car in a switching freight train was derailed and the conductor killed.

18th, on Chesapeake & Ohio near Lees, Va., a freight train was derailed, killing the engineer.

26th, on Alabama & Vicksburg, near Vicksburg, Miss., a sleeping car at the rear of a passenger train jumped the track while running at high speed and fell down a high bank into a pond. A number of passengers were bruised and all in the car were partially submerged in the pond.

And 20 others on 16 roads involving 6 passenger and 15 freight and other trains.

OTHER ACCIDENTS.

14th, 1 a. m., on Chicago & Grand Trunk, near Climax, Mich., the locomotive of a freight train was wrecked by the explosion of its boiler, and the engineer, fireman and 1 brakeman were killed.

16th, on Great Northern at Brockton, Mont., the engine of a freight train was wreeked by the explosion of its boiler, the fireman being killed and the engineer injured.

A summary will be found on another page.

Extension Belpaire Boiler for 10-Wheel Locomotive.

The boiler here given shows an interesting departure in shape and bracing from the ordinary practice. The boilers of this design were constructed for some 17 in. × 24-in. 10-wheel locomotives built at the New York Locomotive Works for the Wheeling & Lake Erie Railroad. It was desired by the railroad company that the Belpaire type be used, instead of the wagon tops as on previous lots of engines, and as it was also desired to have the Belpaire portion of the boiler higher than the forward courses of the waist, the course immediately forward of the flat part was made of sufficient diameter to bring the top of this sheet as high as the top of the Belpaire box. This provided an elevated position for the dome and made the construction of the boiler forward of this point similar to that of the radial stay wagon top boilers.

The connection at the corners between the shell and the firebox consists of pieces shaped in a former. The gusset stays for the back head are not commonly used, but may be effective. Perhaps, however, there should be some longitudinal through stays. The extra steam room allowed by the diameter of waist is of benefit to the action of the boiler. Regarding the carrying forward of the top line of the boiler little need be said as to its advantages, as the excellent results obtained on the Rio Grande and many other lines with this extension top have already proved its value.

Rokusek's Patent Local Ticket.

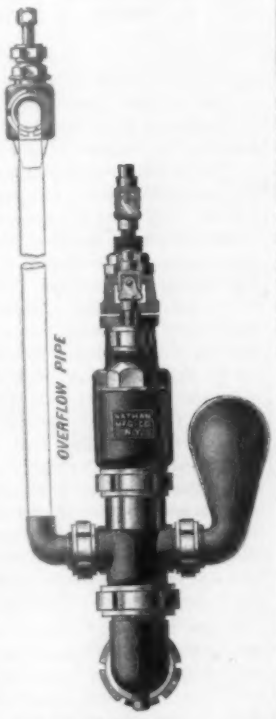
Mr. Albert Rokusek, late General Passenger Agent of the Cleveland & Canton, has had in use on that road for the past 18 months the "Universal local ticket," which he has patented. The peculiarities of this ticket, like those of several other recent devices, are (1) that one form covers several destinations and (2) in the manner of stamping or preparing it for sale. As a considerable number of names of stations can be printed, in order, on the ticket, a very small number of forms answers for all the local business on even a large road. When the ticket is to be sold, that one of the stations intended to be used is made more conspicuous than the other names and the inscription on the ticket shows that all the other names are to be disregarded. Mr. Rokusek's scheme for doing this is to print, with a rubber stamp, a heavy line above and below the station name which shows the true destination, and to obliterate the other names immediately above and below, by the stamp. In the sample which he has sent us the stamp impression shows the name of the road, name of station from and date. Part of this matter is above the heavy lines and part below, and the whole is printed in heavy type with dark ink, so as to contrast sharply with the other printing on the ticket, and cause the destination to stand out prominently. The stamp, made on the model of R. H. Smith's patent lever stamp, is provided with a form on which the ticket is laid so as to insure an accurate impression, and for a round trip ticket the going and returning coupons and the stub are stamped simultaneously.

SWISS CABLE-RACK ROAD DATA.

Power System.	Turbines.		Electric Transmission.			Water Ballast.										
Name of road	Lausanne-Ouchy.	Lausanne-Gare.	Bürgenstock.	Salvatore	Stanserhorn	Giessbach.	Territet-Glion.	Gütsch.	Marzili.	Lugano.	Biel-Magglingen.	Zürichberg.	Beatenberg.	Ecluse-Plan.	Lauterbrunnen-Grütsch.	Ragaz-Wartenstein.
Date of opening	March 16, 1877.	December 5, 1879.	July 7, 1888.	March 27, 1890.	To be opened June 1, 1893.	July 21, 1879.	August 19, 1883.	August 22, 1884.	July 18, 1885.	November 8, 1886.	June 1, 1887.	January 8, 1889.	June 21, 1889.	October 25, 1890.	August 14, 1891.	To be opened soon.
Length in feet, measured on incline	4,800	1,029	3,083	5,356	1st sec., 5,281 2d " 3,510 3d " 4,067	1,092	2,066	524	348	800	5,523	548	5,500	1,260	4,500	2,591
Difference in altitude of termini in feet	331	104	1,430	1,933	1st " 909 2d " 1,640 3d " 2,020	295	977	246	102	186	1,453	110	1,824	357	2,200	675
Range of grades, per cent.	2-11.6	0-11.6	32-58	17 60	1st " 10-27 2d " 40-62 3d " 40-62	24-32	40-57	51-53	30.2	20-24	20-32	20-26	28-40	22-37	41-60	23½-30.37
Average grade, per cent.	6 9	10	52.8	40	1st " 17.6 2d " 55 3d " 57	28.2	54	52.8	30.2	23	27.26	22.43	34.58	26.8	55.4	26.8
Rack rails	None.	Riggenbach system.	Abt system.	Abt system.	None.	Riggenbach system.	Riggenbach system.	Riggenbach system.	Riggenbach system.	Abt system.	Riggenbach system.	Abt system.	Riggenbach system.	Riggenbach system.	Riggenbach system.	Riggenbach system.
Number of new cables	6	6	1	None.	.....	None.	None.	None.	2	2	None.	1	1 hoisting cable. 1 ballast car cable.	None	None.	.....
Factor of safety of cable	9.9	10	10.2	9.9	.....	7.1	8.87	16.3	16.8	13.5	6.22	8.7	8.85	13.7	8.5	9.3
Diameter of cable in inches	1.15	1.16	1.2	1.28	.....	0.95	1.38	1.2	0.96	1.08	1.28	1.02	1.75	1.46	1.30	1.08
Total cost, approximately	$577,200		$69,200	$117,324	$300,000	$30,000	$94,000	$17,200	$14,168	$37,000	$90,000	$51,869	$134,160	$44,000	$165,800	$45,000

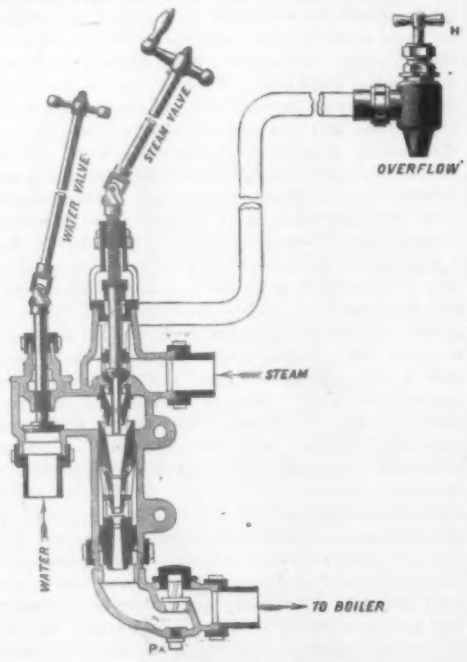
The New Nathan Injector.

The injector shown in our illustration is made by the Nathan Manufacturing Co., of New York, and is claimed to possess some novel and valuable features. Among these is that, while the body of the injector is located below the bottom of the tank the overflow is placed above the highest water level in the tank, and in a position conveniently watched by the engineer. The injector itself is of the non-lifting type and must be so located that the water will flow into it.



Side View.

It is made in two types, one of which is a self-contained instrument, containing within itself the steam and water valves required for starting, stopping and regulating the injector, the operating rods for which must be led into the cab. The second type has detached starting and water valves and is intended for use where it will not be convenient to use the rods. It will start under all



Sectional View.

circumstances, and is unaffected by hot suction or leaky boiler checks, and it is claimed that the feed can be graded 50 per cent.

Swiss Cable-Rack Road Data.

In a series of articles on Swiss mountain cable-rack roads, by Emil Strub, in the *Schweizerische Bauzeitung*, from which extracts have already been given in the *Railroad Gazette*, a comprehensive table is submitted, giving the more important data of the various roads in operation and in course of construction. The extent of this table makes its reproduction here impossible, and we have boiled it down, taking such of the particulars from the original table as would seem to be of more general interest. In its contracted form the table, it will be noted, gives the names of the several roads—16 in number—the dates of opening, lengths, grades, cable diameters, systems of operation, etc., making altogether a valuable record.

While we have used the general head "Cable-Rack Roads," it will be observed that this does not quite properly apply to two of the lines on which cables only and no rack rails are employed. On all the others, however, the combination system is in use.

In the case of those roads classed under the subhead of electric transmission, it is to be understood that the available power, taken from the mountain streams, is used in electric generating stations, and from these the current is led, over varying distances, to the lines of the railroad, where it is utilized by electric motors driving the winding drums.

The Cost of Power.

Mr. Barton H. Coffey discusses the subject of cost of power in internal combustion engines in a paper read before the Engineers' Club of Philadelphia several months ago, and published in the July number of the club's proceedings.

Mr. Coffey says that the question of cost of power production involves so many variables that a general solution for all cases is practically impossible. The constants, so called, in this matter, however, can be readily figured out, so that when the special conditions of a case are given the problem can be easily solved. Following this method, Mr. Coffey has reduced all quantities to the basis of the horse power, however, and as a result gives, among other things, three tables containing the costs per thermal horse power for three different kinds of fuel, and for varying prices of the fuels, the latter being illuminating gas, petroleum gas and petroleum. A fourth table gives the absolute efficiences of gas engines having cylinders from 4 to 18 inches in diameter. From the data of the four tables together the cost of an actual horse power, under various conditions likely to arise in practice, can be computed.

The internal combustion engine taken by Mr. Coffey for his consideration is essentially of the Otto type in which there is one power stroke in every four; that is to say, during the first stroke the mixture of air and fuel—the latter in vapor, gas, or liquid form—is drawn into the engine cylinder; during the second, or return stroke, the mixture is compressed; during the third it is ignited and expands, performing useful work, and during the fourth, or second return stroke, the products of combustion are exhausted from the cylinder.

The value of Mr. Coffey's tables, of course, depends very largely upon the reliability of his calculated absolute engine efficiencies and his assumption as to the calorific value of the different fuels. The efficiencies he calculates by a simple formula, which, however, has been misprinted in the paper and should read $E = 6.1 \sqrt{\text{cylinder diameter}}$, while for the fuel values he takes 650 British thermal units per cubic foot for ordinary illuminating gas; 162 thermal units per cubic foot for producer gas, and 21,738 thermal units per pound for petroleum of a specific gravity of 8. These values, it is fair to presume, are not overstated. The accuracy of the engine efficiency formula is perhaps not altogether beyond question, though at present there are, so far as we are aware, no collected data of experimental investigations on this point with which to compare it. What few actual test figures there are show a slightly lower percentage of efficiency than the formula gives.

The general conclusions of Mr. Coffey as well as of Mr. P. A. N. Winand, who discussed the subject at some length, are, as was to be expected, that the possibilities of the type of engine considered are of the most promising character, quite overshadowing those of the steam engine, in which, it was maintained, almost the closest possible approach has been made to the attainable limit of efficiency.

Mr. Winand, particularly, gives some interesting figures of fuel consumption in gas engines in actual daily work at different places, and compares the relative costs of installation and operation of steam and gas engine plants.

Appended to the paper is some further discussion, somewhat irrelevant in character, but none the less interesting, giving particulars of cost of power transmission with special reference to the work of the Niagara Falls Construction Co.

Another contribution to the subject of power costs, with special reference, however, to Mexico and the western mining regions, is given in the same number of the Engineer's Club proceedings by Mr. A. Falkenau. The author gives the results of observations made by him during a trip through Mexico and the Rocky Mountain mining regions, the special object of which was to examine into the possibility and desirability of opening up a trade in Mexico for mining machinery. The local conditions of labor and wages, and the ore milling and extraction methods in both countries are outlined, and the point is brought out very prominently that in Mexico, more particularly, the high cost of coal or of any other kind of fuel and the difficulties of transportation have made the introduction of modern steam power machinery practically impossible.

Then, too, while the cost of man and animal power in Mexico is exceedingly small, the maintenance of a modern machinery plant is very expensive owing to the lack of skilled labor and facilities for making repairs. The fuel cost, already mentioned, is, according to Mr. Falkenau, from three to four times as great in the Mexican as in our western mining regions.

Thus, most mining camps in the Rocky Mountains can obtain wood for fuel, as well as for building and for underground work, within a radius of ten miles, and the price for fire wood ranges from $3 to $4 per cord. At Zacatecas and Guanajuato, two of the largest mining districts in Mexico, the firewood, such as it is, must be carried by burros from points 60 to 80 miles distant. In the southern part of Chihuahua, mesquite and dry oak, used as fire wood, costs 75 cents per carga, Mexican money, a carga being about 300 pounds. This is equivalent to a price per cord of $10, American money. Again, in the Rocky Mountain region there is a comparative abundance of good coal which, laid down at the mining towns, costs from $6 to $7 per ton. In Mexico, on the other hand, as far as present developments are concerned, there is none whatever. English coal at the City of Mexico and Pachuca costs $20 a ton. The Mexican Central Railroad carries its coal from Southern Colorado, and along the line of the roads it costs $16 50; at points off the line the price is $20. Laid down at the mines, where it is used only for blacksmithing, it costs anywhere from $20 to $30 per ton, according to location. In view of the lack of all other natural sources of power, the Mexican is thus almost entirely dependent on mule or horse power and man power.

The great cost of introduction and maintenance of steam power is, in fact, well shown by the circumstance that the Mexican Government admits coal and mining machinery free of duty, while on many other articles the duties are exorbitant. When steam power machinery has been installed the working expenses have always reached a ruinous figure and have caused resort to the old-fashioned, but, under the circumstances, more efficient methods previously practiced. Instances are given by Mr. Falkenau of several stamp-mills and pumping plants to bear out this point.

Just what the solution of the power-cost problem in Mexico will be cannot well be foretold. Mr. Falkenau, however, anticipates that the time will come when we shall generate power at our coal mines and from our great concentrated water powers, and transmit it electrically all over the Southern Republic.

The Illinois Central Improvements in Chicago.

The work on the elevation of the tracks of the Illinois Central in the city of Chicago is being pushed with speed. Excavations are being made for the abutments and a trip along the line of road between Forty-seventh street and Sixty-seventh street discovers great activity. The company has decided to use Bedford dressed stone for all abutments at street crossings. At the Midway Plaisance the road will be carried on trestle work until after the closing of the Exposition.

All bridges crossing the streets will have solid paved floors. The distance between the lower line of the floor and the top of the rail will be 16 in. or less. All bridges will be of the plate girder type.

Work on the new station at Park Row is progressing rapidly. About one-half of the piling is in for the pier foundations for the main building. This work will be pushed so as to have the building inclosed before winter sets in. Work on the new shops at Burnside will be pushed so as to allow the shops and engine houses at Weldon station to be removed at the earliest possible moment.

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EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

The United States Bureau of Statistics has sent out the report of exports of breadstuffs for the year ending June 30, 1892, and the figures are really wonderful. The total values in millions of dollars are 289 for 1891–2 and 123 in 1890–1. The quantities of wheat (and flour reduced to bushels) are, in millions of bushels, 221 in 1891–2 and 104 in 1890–1. The quantities of corn are (still in millions of bushels) 74 in 1891–2 and 30 in 1890–1. The *Chronicle* makes all of these quantities larger, as follows:

	1892.	1891.
Total values	$299.000.000	$128,000,000
Wheat and flour bushels	225,225,000	106,000,000
Corn	75,000,000	31,000,000

In any event the figures are those of the most prosperous crop year in our history. The average price was high too, having been $1.02½ a bushel for wheat. The value of breadstuffs exported in 1880 was 288 million dollars, but in no other year has it ever come within about 29 million dollars of the value of the year just ended. The average for the 18 years, 1874–1891 inclusive, was 167 million dollars. The export of wheat and flour was never before nearly reached. The greatest quantities were 186 million bushels in 1881 and 180 million in 1880. The average for 18 years was 115½ million bushels. The quantity of corn has been exceeded several times, as follows (in million bushels): 1878, 85; 1879, 86; 1880, 98; 1881, 92; 1890, 102. The outlook for the next year is another large crop but probably not as large as last year, and perhaps lower prices.

"Metal ties are a failure" is the head line under which a Philadelphia paper announces that the order has gone out on the Pennsylvania Railroad to take up the steel ties now in the tracks of that road. The generalization is a little bold. It would be safer to say one metal tie under certain conditions is a failure. The Pennsylvania has tried in a small way several kinds of metal ties, but it has not yet tried the best kind. The best steel tie that it has used is that of the London & Nortwestern. This is an inverted trough with open ends, and it has given trouble from shifting laterally, of course. On the London & Northwestern it is buried in ballast to the height of the rail and may keep its place satisfactorily; but with the ballast flush with the top of the tie that could hardly be expected of an open tie. For a real trial the company should have taken a tie of one of those kinds of which millions are in use, and not experimented here with an English experiment. A successful metal tie would not be hard to find. But we quite agree that mechanical success and commercial success are quite different matters, and we have always doubted and still doubt if the time has come to use metal ties in this country except in special cases. For instance, the application mentioned in this issue, of a metal tie and 100 lb. rail in the Fourth avenue tunnel of the New York Central may very likely be a great success. That is a place where it costs inordinately to touch the track, and where a good deal of money can properly be spent just to keep trackmen out of the way. The usual comparisons of first cost of steel and wooden ties, and of interest and maintenance charges do not hold at all in such a case. There are a good many other places in this country where steel ties can probably be used with considerable economy, even at present relative prices. Indeed, we still hold that the wooden tie has great practical advantages over any metal tie yet devised, and that these advantages will not be given up until more is done in the way of tie preservation, both by treatment and by the use of tie plates, but we are prepared to see such a cheapening in the cost of production as will make railroad officers look into the matter still more carefully than they have done. Meanwhile, we suggest that those who are designing or making steel ties read the valuable paper which is printed on another page.

The investigation of the Illinois Steel Company, at Chicago, by the Interstate Commerce Commission, if correctly reported, amounted to nothing at all. The postponement of the inquiry until September is on account of the refusal of the officers of the short railroads, which connect the steel works with the large railroads, to answer questions, but the most important question, that whether the railroads which control through rates pro rate with the switching railroads, has been answered in a very direct manner, and the question to which an answer was refused, that about the interest of the steel company in the stock of the short railroads, is a secondary matter. The railroad witness said, according to the reports, that all the charges for transportation (on the local roads) came direct from the steel company, at a specific rate per car. This testimony, if unshaken, disproves the vital accusation in the case, for it shows that the through lines of railroad do *not* absorb the switching charge. Even if it had been shown that they did absorb it, the Commissioners would have been obliged to declare the practice entirely legal, and it is hard to see how they could criticise it, even on grounds of equity. In dividing a rate of, say, $60 on a car from Pittsburgh to Chicago, the proportion due to the last five or ten miles of the road may be $5 or it may be $2 or it may be 50 cents, and this is one of the questions which the Commission has distinctly decided that it would evade as long as it could. And if, after all, the local charge were shown to be exorbitant and the railroads were shown to be unjustly absorbing it, the fact that cartage charges have been absorbed in a very lawless way by many of the roads at Chicago and elsewhere would deter any jury from punishing any of the parties to this case. It is doubtless against public policy for a manufactory to greatly enhance its income by operating short railroads which are made profitable by the connivance of the large railroads, but if any one deserves to be corrected by the Courts it is the State of Illinois, for making these little roads common carriers. And finally, the steel company, whether its railroads are on its own private property or not, is very strongly intrenched in the Boss Tweed position. Not only can it ask, What are you going to do about it; it can point to the Lehigh Valley coal-rate case, the dressed beef combine in Chicago and other well known examples in support of its claim that the question will remain unanswered for a long time.

The Civil Engineer and the Railroad.

In the four years 1880–1883, 34,871 miles of railroad were built in the United States. The addition to the mileage existing at the beginning of that period was 43 per cent. In the four years 1888–1891, 21,572 miles were built, an increase of 14 per cent in the mileage.* This represents a great absolute falling off in the demand for civil engineers for surveys and construction; but the falling off in demand, relatively to the number of men fitted for the work, is not indicated by these figures. In the years that elapsed from 1880 to 1890 the output of the civil engineer factories increased prodigiously. New schools were established which were quite competent to give a fairly good engineering education and the old ones grew in capacity, in the numbers graduated, in the numbers taking partial courses and in the grade of instruction furnished. It would take a tedious investigation to get at an approximation to the increase in numbers of civil engineers turned out in those years. Even complete files of the catalogues of the scientific schools would not give us a very accurate notion because of subdivision of courses and changes in the names of degrees granted. Many mining engineers, for instance, or bachelors of philosophy have taken up the special work of civil engineers without taking that degree.

But the decline in railroad building only represents part of the decline of the last ten years in employment for civil engineers. The falling off in surveys, from preliminary to final location, has been still greater than that in construction. This, too, is a statement hard to prove by statistics. No statistics exist of the miles of railroad surveyed ten years ago. It is only within three or four years that any one has attempted to collect those curious and interesting, but mostly profitless, figures. But those who are familiar with such matters know that it is not so easy as it was a few years ago to launch a party in the field. People are getting wiser; the "Wall street man" is not so ready to put up money, and the country voter is more wily about bonding his town on the strength of a big name and a small charter. If all the surveys made for railroads that have never been built could be collected and compiled they would make a pretty good topographical map of the United States. But this vast industry will never again thrive as it has in the past. The era of reckless surveys has passed, and so to a considerable degree has the era of construction. That is, the ratio of new line to existing line will be less and less as the years go on, and the amount of that kind of work to be done as compared with the number of men to do it will be far less in the future than it has been at any time since the war.

But as the old occupation passes away a new one appears and one of indefinite extent. It is a mistake to suppose that a railroad is ever finished. Money must forever be poured into it. There are few railroads in the country that are not being improved year by year out of operating expenses, and heavy charges are constantly made to capital account for betterments. To a great degree it should be the work of the civil engineer to see that that money is well spent. He is responsible for much of the internal friction of the machine that he has built and he is the man to take it out. Within the necessary limitations of time and money that were put upon him, he is responsible for some railroad location that will be classic for its skillful choice of ground and for the grasp of future conditions; he is also responsible for some location that would discredit Macaulay's schooiboy. It results that we often find the best grades in the worst country. For example, the Chesapeake & Ohio crosses the Alleghanies with opposing grades eastbound of 29 ft. and from Richmond to the sea it goes hopping over a succession of 40-ft. grades. In the next ten years great sums must be spent not only in heavier rails and bridges, ballast, signals and heavier engines, but in improvement of grades and line.

In fact, with most railroads it will be a matter of life or death to increase freight train loads. In 1890 the average train load was 163 tons, the average ton-mile rate .93 cent and supposed average profit per ton-mile .33 cent. But 62 per cent. of the railroad stock of the country paid no dividends and the average dividend was 1.8 per cent. In 1882, the ton-mile rate was 1.23 cents; the rate fell 24 per cent. in eight years. What will happen in the next eight years no man can foresee, but there must be great economies or great failures. The first, most obvious and most effectual economy is increase of train loads. For instance, the New York Central increased its loads from 186 tons in 1888 to 250 tons in 1890, and was able to hold its business and make money alongside of a free water-way. We see one curious and striking result. In 1891 the grain brought to New York increased 86 million bushels over 1890; but the canal brought only 1½ million bushels more. The Erie alone, which has a fine equipment of modern freight engines, brought to New York as much grain last year as the Erie Canal, and the New York Central and the West Shore together brought about twice as much. In the cases of these roads the operating economies have been mostly in equipment and motive power, but much has been done in betterment of permanent way. On the Lake Shore still more important results will be shown soon from reductions of grades. Another striking instance of operating economy may be seen on the Panhandle, where the freight handled increased in five years 106 per cent. and the engine mileage only 26 per cent. This was due partly to heavier engines, of course, but partly also to reduction of grades and increase of siding and yard facilities. The Chesapeake & Ohio is so situated that it must work at very low ton-mile rates. In 1891 it carried freight at .525 cent a ton-mile, and made money, while the *cost* of carrying on the New York Central was put at .57 cent. The train load of the C. & O. that year was 273 tons. This was made possible by its low-grade line.

* The yearly totals are from Poor's "net increase" and are a little less than the actual building, for *some* railroad is actually abandoned, or is written off the lists, each year.

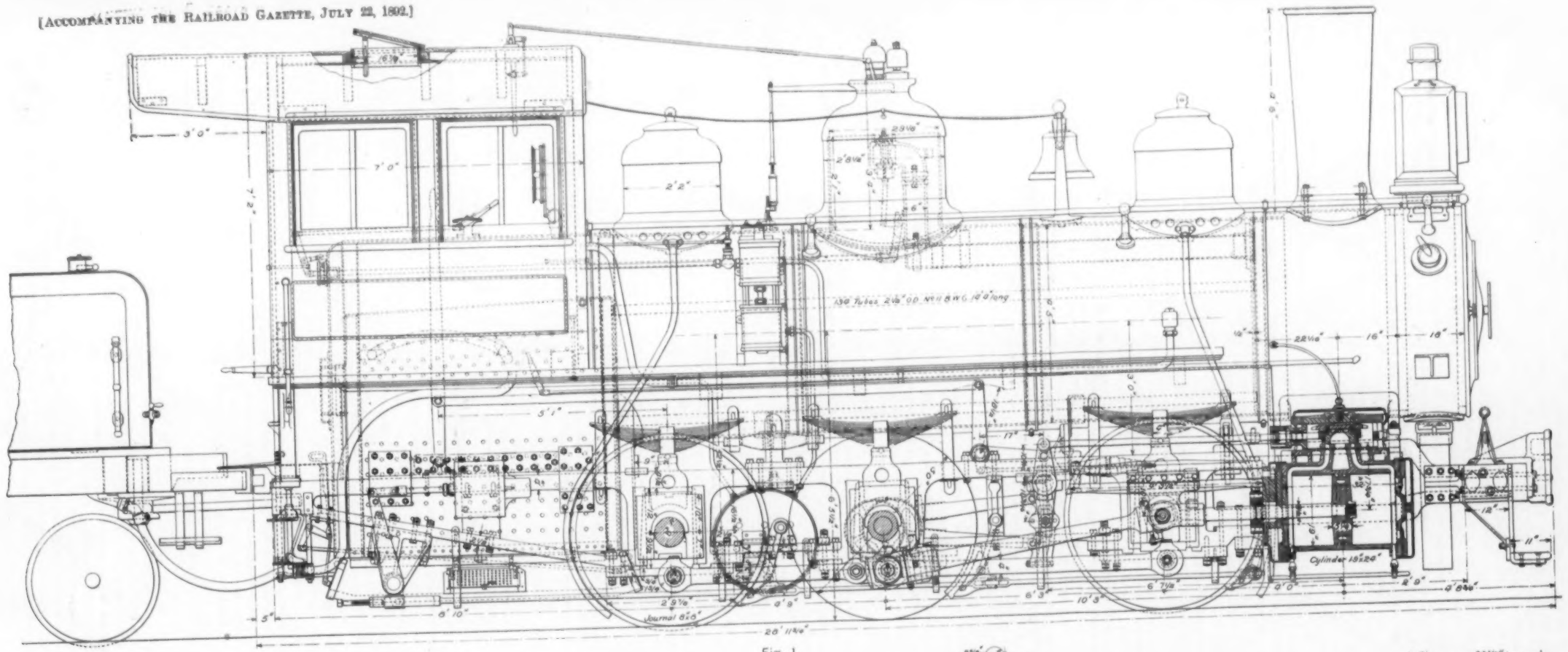

Fig. 1.

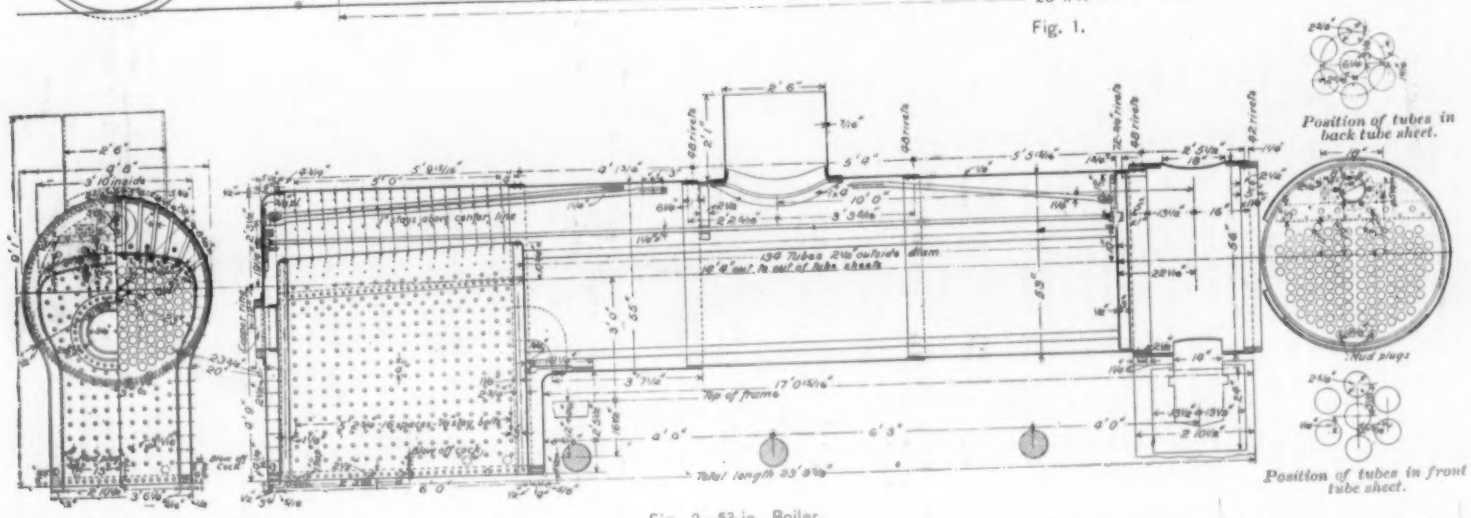
Position of tubes in back tube sheet.
Position of tubes in front tube sheet.
Mud plugs
130 Tubes 2¼" outside diam.
10'0"
Top of frame
Total length 23'9½"

Fig. 2—53-in Boiler.

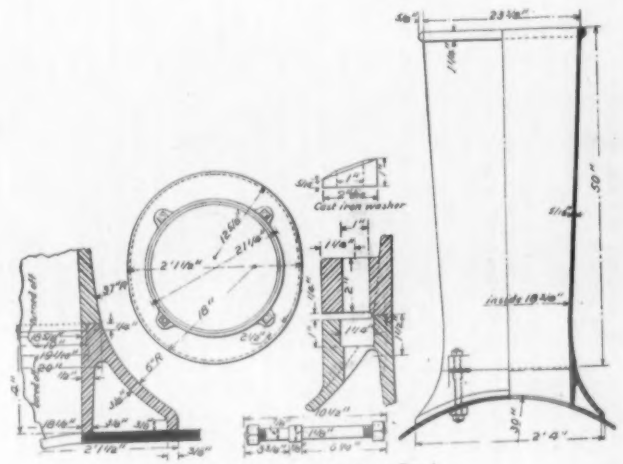

Fig. 6—18½-in. Cast Iron Stack.

STANDARD SIX-WHEEL SWITCHING ENGINE—BALTIMORE & OHIO RAILROAD.

Designed under the direction of Mr. G. H. Hazelhurst, *General Superintendent of Motive Power.*

Such is a broad and general suggestion of the class of problems that must be taken up by the officers who are to control the railroad properties of the United States in the next decade. They are problems which the civil engineer is especially fitted to handle; and aside from the questions of grades and power, he has a whole new art to develop in the rearrangement of yards and sidings. But beyond this he will find a higher and broader field. Railroading is a profession. Everyone doesn't know it yet, but it is; and the highest places in that profession will slowly be filled by men of knowl edge, judgment and character-qualities which the training, the work and the traditions of the engineering profession develop to the highest degree. So, while the railroad may never again furnish the chief field and the chief practical school for the civil engineer of America, it will always be one of his broadest fields and best opportunities.

The Anthracite Coal Traffic and the Consolidation.

The first anthracite coal ever shipped for consumption was taken out of the Wyoming Valley and shipped by the Lehigh Coal & Navigation Co. by canal to Philadelphia, the total being only 365 tons. In the next year that amount increased to 1,073. The Schuylkill canal, five years after, in 1825, began shipping from Schuylkill Haven, and four years later the Delaware & Hudson entered the field with a tonnage the first year of 7,000 tons, the total for that year being 112,083. The increase was steady from that time until 1833, when the total shipments had risen to 487,748. In the following year for the first time there was a decrease, and the shipments fell off to 376,636 tons. The decline was fairly distributed through the different regions, and four years later there was a falling off from the totals of the previous year, for in 1838, with four companies operating, the total shipments were only 739,293 tons, after eighteen years of mining.

The development in the following year was rapid. Other regions were opened, and until the panic year of 1857 there was a constant, and with very few exceptions a progressive increase. The Reading, which had gained most rapidly, suffered most. It entered the field with rails as early as 1835, and up to that time it had mined more than half the total output, but in 1859 it fell as low as 40 per cent. From the panic until the close of the war the coal trade was irregular and feverish, for anthracite had not come into general use for manufacturing at distant points, and the cost of transportation excluded it from markets which are now most important. Not a pound of it went West until after the war, and so from 1857 to 1862 the production grew only a little more than a million tons.

The Lackawanna had been opened in 1849 and the Lehigh Valley in 1847, but the period of development did not fairly begin until 1866, when after a loss for the previous year, the tonnage suddenly increased 3,930,076 tons, or very nearly a third, the tonnage of the Wyoming and the Luzerne fields handled by the Delaware & Hudson and the Delaware, Lackawanna & Western having almost doubled. This was followed by alternate increases and decreases until 1872, when the actual increase of 5,136,486 tons, or about a third, was the largest for any year before or since. It was at this time that President Gowen, alarmed at the growth of the other regions, began the policy of acquiring coal lands, he having succeeded Charles E. Smith as President of the Reading in 1870. The Reading in that year had gained only about two per cent., while the Lehigh Valley had increased its tonnage about 40 per cent. and the Delaware & Hudson and the Lackawanna together almost 50 per cent. And yet although sixty millions of indebtedness was quickly piled up by the purchase of these lands, there was no corresponding increase in the output.

The extraordinary increase in the fixed charges threw the company into financial embarrassment in 1876, for a very large proportion of the lands were entirely unproductive, because the demand for coal did not warrant their opening. From 1871 to 1876 the production of coal was normal, and in the former year the production was actually greater than it was in 1876, when the company abruptly ceased to pay dividends. It did not reduce from 10 per cent., but it stopped outright. In 1872 the actual profits were equal to 23 per cent. upon the capital stock, and when the accounts were gone over and the balance sheet of the Coal & Iron Company, with its indebtedness of $60,000,000, was shown, it appeared that all this surplus and more had been swallowed up in interest upon this debt for which the railroad company was liable. It is to be noted that very high prices were paid for these lands, Moses Taylor clearing $1,100,000 on the sale of the Manhattan company's lands alone. The purchases were made with seven per cent. bonds for the greater part of the purchase money, and as these bonds were thrown on the market at 60 to 70 cents, it will be seen that the actual price was far in advance of that which a cash buyer would have paid.

Since the plan of returning the tonnage statistics has been changed it is no longer possible to estimate the relative importance of each company as a coal carrier. Mr. Jones now makes his returns by districts, and as all the companies have an entrance into more than one field, neither one being confined to the Upper, the Lower or the Middle field, there are no means of ascertaining as before what proportion of the total output falls to each company. There was considerable jealousy from the first at the publication of these figures, since each company was unwilling to let the other know what it was doing. When the first allotment was made after the great fight in 1879, which finally drove the Reading into bankruptcy, the figures were carefully taken by each company and tabulated. They showed just the tonnage of each company for its own use, for local markets and for competitive trade. The capacity of each colliery was also put down. An average was struck after taking all these considerations into the calculation, and an equation reached between the production for the previous year, for three years previous and for five years previous. One unexpected result was the discovery that the Reading in its anxiety to secure lands had not kept up its proportion of the production, and that even under a competition in which the Reading was foremost, its proportionate output had fallen off.

Since then the Lehigh Valley has built into the Schuylkill region and tapped the territory controlled heretofore by the Reading. It has also gone to Scranton, extended its Pennsylvania & New York line to the Erie, and now into Buffalo over the Lehigh Valley Railway of New York, having provided itself in advance with abundant terminal facilities and a line of lake steamers. The Lackawanna has built its own line to the lakes, and the Reading some time ago encroached upon the territory exclusively controlled by the Pennsylvania by the building of the Shamokin, Sunbury & Lewiston, and the Pine Creek which gave it a closer connection with the Vanderbilt system, while the latter supplemented it with the Beech Creek and was only prevented from going through to Pittsburgh by one of the bitterest fights ever known in traffic and in the courts. The Pennsylvania had meanwhile struck the Reading in a vital point by running its line up the Schuylkill Valley on the other side of the river and the situation was even more complicated.

It is therefore impossible to get at the exact capacity of any one railroad, since the tonnage is often duplicated and there is no uniformity of returns to show just what tonnage originated on each road and what was received from connecting lines. Another statement, which is of vital importance, is a return which each company keeps rather closely to itself. This is the actual capacity of each colliery, the average amount which it can take out in a week when working on full time with a full force. A report by days would not be satisfactory, the most accurate return would be an average of hours a week and number of days, then allowing 10 hours a day. How important this is was shown by President Harris in a report published some years ago. He wanted to show that the average cost was materially reduced by steady work under favorable circumstances.

President Harris, of the Lehigh Coal & Navigation Co., who is now Vice-President in charge of mining under the lease to the Reading, care fully separated the figures that were solely pertaining to cost whether a mine was worked or not. This included the cost of pumping, repairs, feeding and caring for mules. On another side was the miners' wages and those expenses which were cut off entirely when the mine was not in operation. He found that with intermittent work during January, the coal cost was higher than the price at the mine, and the average cost of production reached $3.53 a ton. During September the mine worked full time without interruption and under the most favorable circumstances as far as weather and transportation were concerned. In that one month the "coal cost" was reduced to 90 cents a ton and the total cost to $1.09 per ton. The net result to the company was its full proportion of the fixed charges for the month and two per cent. on the capital stock. So great was the economy of steady work that four per cent. could have been paid upon the stock out of the profits during August and September, if the traffic for the other ten months had only sufficed to meet expenses and fixed charges.

The greatest profit under the new leases of the Reading will come out of the cutting off of competitive expenditures. In the passenger business alone the accommodation will be as great or greater, with a smaller number of trains, since the Lehigh Valley and the Central of New Jersey always made it a point to run trains at about the same time, and race along the Lehigh. One train could have handled the traffic of the two, and now by running them alternately passengers will be better accommodated at less cost to the company. This, however, is insignificant in comparison with the possibility of the better distribution of coal. The cost of hauling over the Wilkes Barre mountain has always been serious and a very considerable economy can be brought about by the distribution of orders so as to fill them from the most available mines. The Lehigh Valley has magnificent terminals in Buffalo, and will soon have its own line through. That company can therefore best handle western shipments, especially as it gets a number of line cars to load. The Reading lines are best fitted for Philadelphia and Southern trade and for coastwise traffic, while the Lehigh Valley can be used for New York harbor at least cost. It will be interesting to note in what proportion cost can be reduced without a direct increase in the price of coal.

June Accidents.

Our record of train accidents in June, given in this number, includes 75 collisions, 88 derailments and 2 other accidents, a total of 165 accidents, in which 70 persons were killed and 299 injured. The detailed list, printed on another page, contains accounts only of the more important of these accidents. All which caused no deaths or injuries to persons are omitted, except where the circumstances of the accident as reported make it of special interest.

These accidents are classified as follows:

COLLISIONS:	Rear.	Butting.	Crossing and other.	Tot'l.
Trains breaking in two	6	..	..	6
Misplaced switch	1	3	3	7
Failure to give or observe signal	8	3	4	15
Mistake in giving or understanding orders	..	5	1	6
Miscellaneous	4	1	4	9
Unexplained	11	9	12	32
Total	30	21	24	75

DERAILMENTS:			
Broken rail	2	Careless running	1
Loose or spread rail	6	Careless switching	1
Failure of bridge	2	Track repairs	1
Defective switch	1	Bad loading	1
Defective joint	1	Animals on track	4
Broken wheel	1	Landslide	2
Broken axle	3	Washout	7
Broken truck	3	Flood	2
Fallen brakebeam	2	Accidental obstruction	4
Failure of drawbar	3	Unexplained	31
Misplaced switch	10		88
OTHER ACCIDENTS:			
Boiler explosion			2
			2
Total number of accidents			165

A general classification shows:

	Collisions.	Derailments.	Other acc'd'ts.	Total.	P.c.
Defects of road	..	12	..	12	7
Defects of equipment	6	12	2	20	12
Negligence in operating	37	14	..	51	31
Unforeseen obstructions	..	19	..	19	12
Unexplained	32	31	..	63	38
Total	75	88	2	165	100

The number of trains involved is as follows:

	Collisions.	Derailments.	Other acc'd'ts.	Total.
Passenger	46	31	.	77
Freight and other	89	57	2	148
Total	135	88	2	225

The casualties may be divided as follows:

KILLED:	Collisions.	Derailments.	Other accidents.	Total.
Employés	11	29	4	44
Passengers	20	1	..	21
Others	5	..	..	5
Total	36	30	4	70
INJURED:				
Employés	78	66	1	143
Passengers	98	54	..	152
Others	4	..	..	4
Total	178	120	1	299

The casualties to passengers and employés, when divided according to classes of causes, appear as follows:

	Pass. killed.	Pass. injured.	Emp. killed.	Emp. injured.
Defects of road	..	34	4	9
Defects of equipment	..	..	4	1
Negligence in operating	20	98	12	79
Unforeseen obstructions and maliciousness	..	10	13	43
Unexplained	1	10	11	11
Total	21	152	44	143

Thirty-four accidents caused the death of one or more persons each, and 31 caused injury but not death, leaving 100 (60 per cent. of the whole) which caused no personal injury deemed worthy of record.

The comparison with June of the previous five years shows:

	1892.	1891.	1890.	1889.	1888.	1887.
Collisions	75	50	64	33	64	43
Derailments	88	109	67	42	76	42
Other accidents	2	8	6	4	3	3
Total "	165	167	137	79	143	88
Employés killed	44	50	41	18	30	13
Others "	26	10	17	17	10	3
Employés injured	143	130	98	49	67	37
Others "	156	107	155	53	58	63
Passenger trains involved	77	58	65	36	51	32
Average per day:						
Accidents	5.50	5.57	4.57	2.63	4.76	2.93
Killed	2.33	2.00	1.93	1.17	1.33	0.53
Injured	9.97	7.90	8.43	3.40	4.17	3.33
Average per accident:						
Killed	0.424	0.359	0.423	0.443	0.280	0.182
Injured	1.812	1.419	1.847	1.291	0.874	1.136

The first passenger killed in June (at Northampton, Mass., on the 1st) was standing on the platform of a car, and probably would have escaped if he had been inside. The most fatal disaster in the month was that at Harrisburg, Pa., on the 25th, which has been heretofore fully reported. Of the other passengers killed, four were in the collision at South Carrollton, Ky., on the 25th, and three at Altheimer, Ark., on the 29th. The worst accidents in the month, other than those just mentioned, were, in the order in which they appear in the list: Stillwater, Minn., 21st; Valparaiso, Ind., 28th; Gladstone, Ill., 18th; San Rafael, Cal., 13th. The South Carrollton collision affords one of the most instructive instances of the need of a block system on single track roads, for if conductors and enginemen will not be careful when studying anew time-table, it is hard to say where or when they can be expected to act with caution. The Stillwater collision enforces the same lesson, though the account indicates very lax discipline. The derailment at Gladstone, Ill., should be a reminder to superintendents who seek safety not only because that is the surest way to make a good financial showingbut also out of humane regard for employés, that they

should run construction trains very slowly or else require the men to ride in a properly constructed car. In a country where stray cattle are plenty, one of the best ways to tempt fate that could be devised is to place a lot of men on empty platform cars and run them over the road at a lively speed.

A Buffalo newspaper is responsible for the statement that a passenger train would have run into the Welland Canal on the 24th, through an open draw, had it not been for an interlocked derailing switch. The collision near Malden, Mass., on the 27th, was largely due to the fact that the trainmen were not familiar with the road at the place where they were doing some switching. An occurrence of this kind is of interest in connection with the custom, which has spread so largely of late years, of running trainmen over two or more divisions. A man whose run extends over 400 miles of road is quite likely to take but a faint interest in a good many features of the line which he ought to be acquainted with. The collision at Manley, Minn., on the 15th again suggests the block system, but, aside from that, the case shows the importance of writing time in both words and figures. The fact that "five" and "four" look somewhat alike when written in a poor hand is patent to every one, and should lead to appreciation of the rule just mentioned, though we do not know, certainly, that the mistake at Manley was made in just that way.

On the 27th a train on the Philadelphia, Wilmington & Baltimore was struck by lightning at Ridley Park, Pa., and the baggage master, who was standing in the doorway of his car, was knocked senseless. A collision, which narrowly escaped wrecking a car filled with passengers, occurred at a crossing of the Pennsylvania and the Philadelphia & Reading roads near Kensington, Philadelphia, on the 24th; and it is said that this was the first collision that ever happened at this crossing although it has been in existence nearly 60 years. The freight train which ran off the track near Middlesboro, Ky., on the 14th, is said to have fallen 200 ft. On the Grand Trunk near Coaticook, Que., on the 20th five passengers were killed by the derailment of a passenger train at a washout. Near Yaquima, Or., on the 6th, a handcar carrying 10 persons was struck by a passenger train and a woman and two children were killed. All the rest of the 10 were severely injured.

Ten passengers were killed on electric railroads in June in four collisions and derailments, resulting from various causes. We have for a year or two noted such accidents of this kind as came to our notice and have mentioned them in this place monthly, but we hardly expected to record such a list as this at this early stage of the development of this class of roads. We give below a condensed account of these accidents and four others. The blame for the accidents is not to be laid to the motive power, of course, and indeed in one case, that at Atlanta, the electric power had given out and "dummies," which we suppose means steam locomotives, had been temporarily put on. But at Boston on the 26th, 11 passengers were injured by jumping from a moving car, which they did because they saw blue flames and flashes coming up through the floor, though they would have suffered no harm if they had remained cool. This accident and another like it must be charged, indirectly at least, to the motive power.

The underlying cause in six of the accidents seems to have been inexperience. The men who operate these cars learn their trade or "profession" directly or indirectly from horse railroad men, and they naturally govern themselves by horse railroad standards. Poor judgment about the proper limits of speed, about the danger of breakage of wheels and about the effect of various circumstances on the safety of the track are doubtless the underlying causes of most of these accidents, as they have been of many others of a similar nature though less disastrous. As the steam railroad men have been half a century in acquiring their present degree of skill and caution, it would be unbecoming for them to point the finger of scorn at the electric railroad "hustlers," who are securing so much favor with the public at the present time; but it is none the less true that the latter should avail themselves more fully of the results of experience before they attempt to run light cars at high speed and at frequent intervals on tracks of all degrees of badness.

The electric-road accidents were: At Omaha on the 5th, 2 passengers were killed and 5 injured; cause, fast running; at Benwood, W. Va., on the 10th, 3 were killed by a collision with a Baltimore & Ohio locomotive; near Lawrence, Mass., on the 11th, 1 killed and 8 injured in a rear collision; near Atlanta, Ga., on the 10th, 4 killed; at Brooklyn, Md., on the 12th, 6 injured; at Scranton, Pa., on the 16th, collision, 4 injured; at East Liverpool, on the 19th, a car containing 30 passengers was overturned and rolled down a high bank, injuring 20 of the occupants, some of them fatally. At Birmingham, Ala., on the 20th, a crossing collision made considerable excitement but no one was injured.

The *Northwestern Lumberman* discusses car shortage, and means for providing against it, in a column editorial. It is stated that the movement of the melon and fruit crops has already caused a scarcity of cars for the lumber men in the South. If the editor's information is accurate and is derived from the whole field fairly, we must conclude that all kinds of old fashioned selfishness flourish in the South. And, it is fair to say, the article says nothing about the absence of these qualities in the North or West. The Southern lumber men have to fight for cars, and nearly every other commodity is favored by the railroads in preference to the products of the sawmills. The non competitive stations always come out at the little end of the horn, and last season many mills were compelled to refuse orders for several weeks, especially in Arkansas. At Chicago the grain traffic always furnishes a supply of empty cars, but during the rush of grain the lumber men have to make vigorous appeals to the higher railroad officers to get the privilege of loading cars which would otherwise go west empty. The lumber manufacturers on the St. Louis & Southwestern road have combined to hire 500 cars this year, which they will mark "Yellow Pine Dispatch." They are going to send a tracer after every car, and if, as last year, the empty cars are diverted on their way back they think some of sending a guard on every car. Whether he will be a Pinkerton with a Winchester is not stated.

Gross earnings in June, as reported by the *Commercial and Financial Chronicle* for 138 roads, amounted to $42,739,485 as against $39,783,121 last year, an increase of 7.43 per cent. The increase in mileage was 2,591, or from 91,405 to 93,996 miles. For the half year to July 1 the earnings (139 roads) were $263,979,266, an increase of $18,634,425 over the same months of 1891. This increase is more than double the increase in 1891 over 1890, thus reflecting in a marked degree the conditions of poor crops in 1890 and good in 1891. The Pennsylvania, Erie, Baltimore & Ohio and three other important roads are not included, not having reported yet. The largest increase for the half year was on the Chicago, Milwaukee & St. Paul, nearly 2¼ millions. The others showing over a million are the Great Northern, the New York Central, the Atchison and the Lake Shore. The Northern Pacific fell off $389,586.

The National safety appliance law is advancing through the several stages of legislation. Last week we printed the O'Neill bill, which passed the House. The Senate Interstate Commerce Committee has made an amendment to this which, from the vague reports given by the press dispatches, will probably be concurred in. We should suppose that it will pass the Senate, and then it will, no doubt, be signed by the President. The experiment will make an interesting study in government for future generations. Indeed, the statesmen of to-day who live five or six years will be able to learn something from it. Possibly it will be instructive even to editors.

American Driver Brake No. 10,000.

The American Brake Co. (Westinghouse Air Brake Co., Lessee) shipped last week to the Canadian Pacific the ten thousandth set of driver brakes which it has manufactured since its organization, and this is an occasion worth noticing in its history.

The American Brake Co. was organized at St. Louis in 1880, its original patents being upon steam driver and tender brakes for locomotive and automatic momentum or buffer brakes for freight cars. The brake tests at Burlington, Ia., in 1886, under the auspices of the Master Car Builders' Association, demonstrated the fact that momentum brakes were not practicable upon 50 car trains, and so that feature of the business was abandoned.

Improvements in driver brakes were in the meantime constantly being made, and the outside equalized pressure brake, which was brought out by this company, and which is now so generally adopted all over America, resulted in a very large business. The company was leased to the Westinghouse Air Brake Co. in 1888, and the equipping of locomotives with driver brakes under the patents owned by the American Brake Co. has since been conducted as a specialty by the latter, under the management of the lessee company.

Ten years ago, the Master Mechanic who favored the application of power brakes to the driving wheels of a locomotive, was the exception. To day there is hardly a Master Mechanic in America or elsewhere who does not admit that they are a necessity, but it is, perhaps, fair to say that this change in opinion has resulted as much from the improvements which the American Brake Co. has made in the equalization and distribution of the braking power on all the drivers as from any other cause.

The Care of Locomotive Boilers in Algeria.

BY C. J. BATES, C. E., M. E.

The following notes on the maintenance and protection of locomotive boilers in Algeria against the destructive action of bad feed water are translated and adapted by Mr. Bates from a long article by Mr. Robert, Engineer of Rolling Stock and Machinery of the Algerian lines of the Paris, Lyons & Mediterranean Railroad.

The feed water procurable in Algeria is nearly always of bad quality containing a large quantity of solid matter in suspension and of various salts in solution. The deterioration of boilers fed with such water is rapid there as well as here. Following the rupture of the tubes close to tube sheet at the grate box* with the shredding of the faces and roof of the grate box, there appear cracks in the angles of the plates at the front and back of the grate box around the stay rods, connecting the tube sheet to the cylindrical part around the staybolts and often from one tube to another. An examination of the interior of the boiler shows on the plates of the firebox and the cylindrical part, injuries almost always of the same kind. All these injuries are chargeable to the bad quality of the feed water; the grate box and the tubes covered by deposits, cooled before by the water of the boiler, have their temperature raised sensibly above that corresponding to the steam pressure, the expansion produces fatal malformations, because the faces of the grate box and the tubes cannot freely lengthen. Another cause is, the materials dissolved in the water attack the plates and injure them.

The first precaution to take is to analyze the water at the points where the engines obtain their supply and to reduce, to strict necessity, the amount taken where the water is bad and increase the amount where it is good. Tenders of large capacity facilitate this operation greatly.

It is noticeable that the worst waters are not always those that contain the greatest amount of incrusting matter; it must not be forgotten that the most hurtful element is the sulphate of lime. With water charged with this salt, the deposits not only adhere to the walls of the grate box, the tubes themselves get covered and it produces an effect curious enough; the clear space between the tubes usually occupied by water is soon obstructed by the deposit, having the form of bark of trees in scales laid over the other-like wafers. This is easy to understand; the tubes receive a film of the adhering deposit, their conductivity is very much changed, they become overheated, increase in length by expansion and curving exert a considerable thrust on the tube sheets; this distortion makes cracks in the film of deposit which is formed; the same action is repeated and gives the deposit the form stated.

To prevent the accumulation of deposit, either around the tubes or in the layers of water surrounding the grate box, it is important to the last degree to make sure of a thorough washing of the boiler before sending the engines into service.

To accomplish this it has been necessary to insert the new autoclaves near the frame of the grate box, in the smokebox and under the cylindical parts. Others place one under the firebox at the points A and B, as shown in fig. 1, in order the better to wash the sides and top of the grate box; and over the cylindrical part near the firebox to clear the tubes at the sides where the stoppage is most to be feared. It has also proved desirable to increase the force of the jet of water, which is used for washing the boilers. Recourse was had to steam pumps driving the water into the conduits at a pressure of several pounds. With this pressure all the deposits, not adhering, are carried away. Finally, at intervals, the boiler is entered to clear out the accessible parts of the roof of the grate box, to clean out loose pieces broken off between the tubes, to clean out around the grate box, give a good washing and examine the ridge plates, truss frames, etc., etc.

The first indications of the use of bad feed water are the leakage of the tube sheets of the grate box, as already stated; the tube insufficiently cooled lengthens and tends to separate from the tube sheet, exposed directly to fire. The remedy for this evil has been to protect the tube sheet by a screen of refractory brick. It has been so far succesful that when repairs were formerly necessary after 24,000 to 30,000 miles now from 90,000 to 120,000 miles of road are traveled, and without which breaking of tubes and leakage close to the front tube sheet were caused. Oozing around the heads of the staybolts shows itself at the same time as the leakage of the tube sheet. This produces oxidation of the copper of the grate box and forms salts of a greenish color, which injure the heads of the staybolts and the surrounding metal. This action, with that of the sulphur contained in the fuel, causes the destruction of the heads of the staybolts and the faces of the grate box, especially in that part near the grate. The leakage is stopped by the use of a mandrel treating, the staybolts like tubes, fig. 2, and by shaping the heads.

It has proved necessary to increase the thickness of the lower parts of the plates of new grate boxes on all sides. This thickness has been increased about four or five sixty-fourths of an inch. When a firebox is reconstructed we secure for a long time the continued tightness of the stay bolts near the grate, by attending particularly to making and placing them. They should have the exact diameter and the thread well filled without play in the tap hole in the copper of the grate box. Made thus we would have great difficulty in screwing them in, if they are forced without play into the holes of the firebox, as in those of the grate box, but this inconvenience disappears if we take care to enlarge the holes in the plates of the firebox by using a little larger tap.

Cracks are frequently produced in the angles of the grate box plates at the front and back, around the staybolts near the grate bars, and sometimes in the roof of the grate box or over the tube sheets. The cracks in the angles of the plates in the front and back of the grate box, which is subject to change of form due to the effects of expansion, do not always necessitate replacing

* The translator begs leave to coin a term to distinguish the rear end of the boiler usually called, as a whole, the *firebox*, from the interior firebox which he would like to, and will in this article, call the *grate box*, as it contains the grate C. J. B.

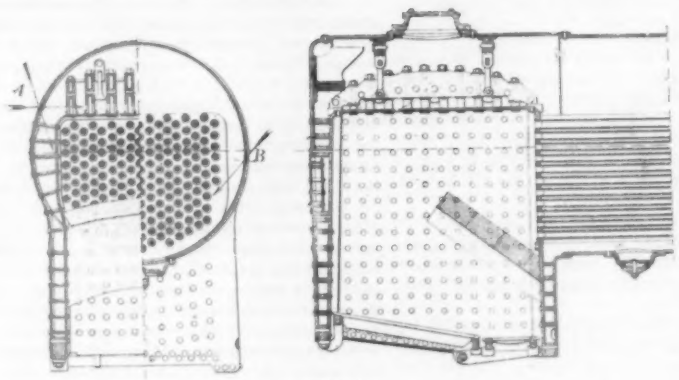

Fig. 1.

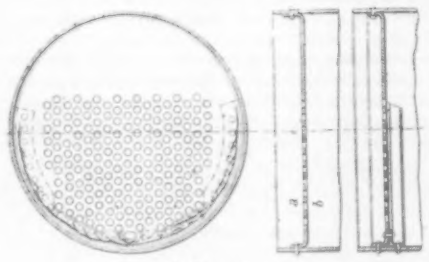

Fig. 11.

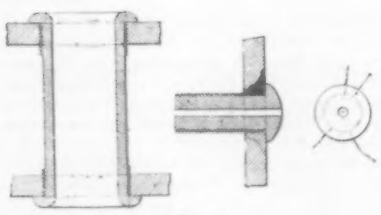

Fig. 6.

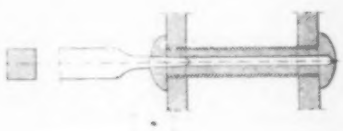

Fig. 2.

P., L. & M. Loco. English Loco.

1. *Old corner.*
2. *New corner.*
3. *Section, bottom of firch x.*
4. *Section, top of firebox.*

Fig. 4.

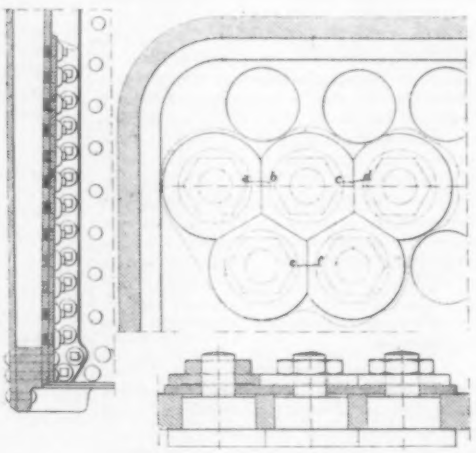

Fig. 7.

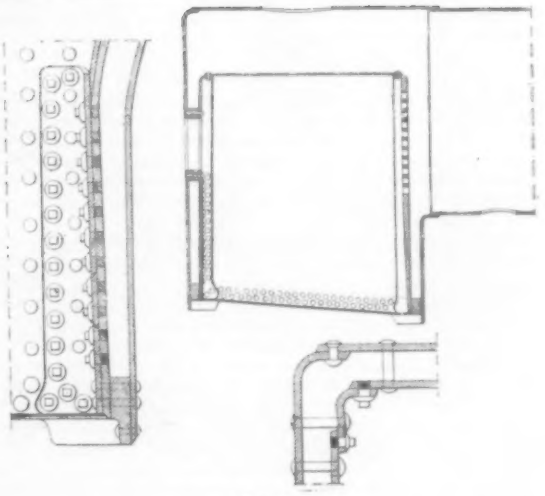

Fig. 5.

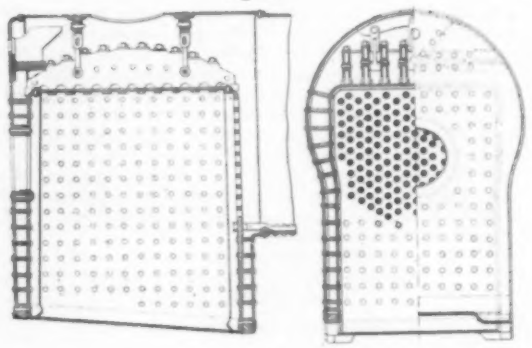

Fig. 8.

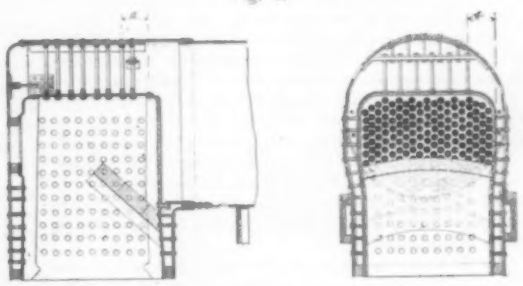

Fig. 10.

THE CARE OF LOCOMOTIVE BOILERS IN ALGERIA.

these plates. It is often possible to apply, at the angles additional pieces held with screws; but it is an operation rather expensive and delicate, that the condition of the rest of the grate box does not justify. It is best to give a curve to the angles of the plates at the front and back, especially at the lower part, with as great a radius as possible. These angles can then vary in shape and permit the expansion of the neighboring faces, figs. 4 and 5.

The cracks around the staybolts most exposed to the fire coincide almost always with the thinning of the walls of the grate box, so they can be repaired by replacing the cracked and worn parts. It is not necessary, however, to replace the piece in all cases. It is better to avoid as much as possible the use of such pieces: as we may if we take care to replace the staybolts by others, as soon as the cracks show themselves radiating around their heads. These special staybolts have the form of a fire tube of which the thickness is great enough to permit the cutting of a thread of about $\frac{1}{8}$ in. They are, as with an ordinary staybolt, screwed into the grate box and outer shell, and riveted at the ends. Their exterior diameter should be great enough to remove all the cracks radiating around the head of the old staybolt. It is not necessary to plug all the exterior parts, many of which that are at a suitable height above the grate can remain open to admit an excess of air useful for good combustion, fig. 6.

The use of the tube stays presents great advantages over the other pieces mentioned, as we avoid making seams in the parts most exposed to the action of the fire. The enlarging of the staybolts is equivalent to their being placed closer, so the plane surfaces subject to the pressure in the boiler are reduced and better braced with those of the outer shell.

The cracks in the tube part of the tube sheet show themselves either around the stayrods connecting this plate with the cylindrical part or from one tube to another. We can sometimes, by removing tubes, replace them by bolts, of which the heads cover the cracks in the grate box; nuts are placed in the interior of the boiler, fig. 7. But it is not a wise expedient to defer for long the partial or total renewing of the tube sheet. In order to avoid for the future serious damage, necessitating long and expensive repairs, it is best to increase the thickness of the tube sheets and reduce the number of tubes to actual necessity.

The cracks in the top of the grate box occur especially when it is strengthened with trusses against the pressure; they are less to be feared when the firebox is of the Belpaire or Becker (fig. 8) type. The trusses encumber the top of the crown, taking the place of the water, so the circulation is impeded and the cleaning rendered so difficult that the deposits cannot be completely removed between the plates of which they are composed. Also the top of the grate box chills badly and shreds and cracks, which necessitates the renewing either of the top if the rest of the grate box is good or of the firebox itself if the wear of the other parts require it.

With the arrangement of Belpaire it would be unpardonable negligence to let the top of the grate box become covered with scale, its use is therefore best when the feedwater is of doubtful quality.

It seems undesirable to obstruct the expansion of the grate box by using this type of firebox, but the expansion is already obstructed by the staybolts of the vertical faces, and those of the crown do not increase the evil, if we take care to leave room for expansion from the rows of stays to the tube sheet. The distance *a* fig. 10, from the second row of stays to the rivets of the tube sheet is about as great as should be permitted for a slight deflection of the crown by the expansion of the grate box. It is the same with the other stays on the side *b*. It might be argued that this deflection is useful to loosen the adhering deposits. It is noticeable, however, that the greater freedom of the grate box stiffened with trusses is questionable; the trusses are bound to the top of the firebox by braces arranged to allow the lifting of the grate box, but examination of pieces shows the deposit sticking to the joints where the movement should occur, shows that in reality the crown of the grate box acts about the same as that of Belpaire or others like it.

So we are justified in preferring a type of firebox with the top bound by long stays of soft steel to that of the grate box. It might be well, however, not to copy the Belpaire plan in all points if the amount of fuel used on the grate is small. With a deep bed of fuel it is very important to give the gratebox considerable depth in order to remove the fire sufficiently from the arches of refractory bricks and from the tubes. It is always useful, however, to increase the height of the grate box, as much to improve the combustion as to increase the evaporation.

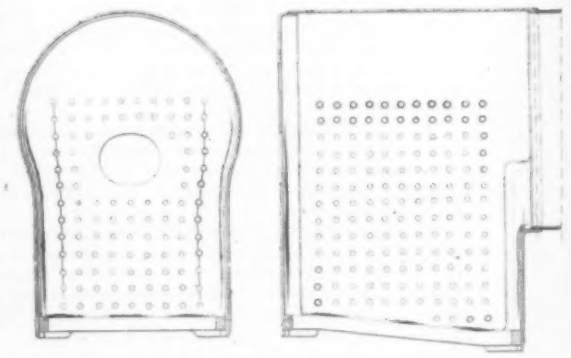

Fig. 12.

The points always attacked, in the boiler proper, are those where distortions are produced, resulting either from the action of the steam or the strains due to expansion. The tubes, for example, arch themselves and exert a thrust on the tube sheets, due to their expansion, greater than that of the boiler. Hence occurs, especially for the tube sheet of the smokebox, a bending which begins at the circumference. This bending, ranging with the temperature of the boiler, has the effect of detaching the deposits formed near the joints, and consequently favors the corrosive action of the water, the metal being uncovered at intervals. We also find on this plate furrows nearly concentric with the boiler, fig. 11. To check the development of these corrosions and strengthen the connections of the tube sheet with the cylindrical part, there is placed in the interior of the boiler a curved angle fixed by rivets or screws to the sheet and to the boiler.

The flanged out plates of the faces of the front and back of the firebox are also always attacked by the water in the same way. It forms vertical grooves about the middle of the flanged part and follows the first vertical row of staybolts, reckoning from the corners. Other grooves are formed similarly almost always near the lower edges of the grate box, and concentric grooves

show themselves around the staybolts at the upper part of the four faces of the firebox, especially on the sides, fig. 12. These can be explained in the same way as for the tube sheet of the smokebox.

The grate box, of red copper, on account of its temperature and the nature of the metal, expands more than the firebox, to which it is connected on all sides. The lower edges, the four corners, and the first vertical rows of staybolts can be considered as the fixed points acting as hinges to the bending that causes the pushing of the gratebox outward. The metal which is bared when the bending changes is attacked anew by the water and forms other deposits which fall in their turn, and so on. The grooves formed in the neighborhood of the hinges follow the lines we have indicated.

These effects are much reduced if the grate box is made with plates sufficiently rounded at the front and back. In this case the elongation of the faces of the grate box will have rather the effect of modifying the curve of the corners than to exercise, through the stay bolts, a push on the cases of the firebox capable of making them yield. These faces would have therefore a much less bending, and would not be subject to attack in the same way. It is notable, however, that it cannot have the advantages of the more rounded form of the faces before and behind the grate box and firebox; the swelling weakens the metal less easily, and the number of staybolts can be reduced. The grooves around the staybolts the farthest from the lower edge of the grate box are also easily explained; it is the expansion of the grate box in the direction of its hight which produces them. This expansion, greater than that of the firebox, bends each staybolt upward, the greater the more it is removed from the lower edge of the firebox, and the more the temperature is raised. The deposits formed around the points of insertion of the staybolts into the firebox fall when the bending changes, which facilitates corrosive action of the water.

(TO BE CONTINUED.)

TECHNICAL.

Manufacturing and Business.

The Brooks Locomotive Works have started in their new foundry a 10-ton electric traveling crane, which has a 40-ft. span, and a travel of 255 ft.

Jas. F. Larkins, formerly with the A. French Spring Co., of Pittsburgh, is now Superintendent of the works of the American Spiral Spring Co., of Pittsburgh.

The Chattanooga Tool Co. has re-elected Wm. W. Gordon, President, and C. S. McKune, Secretary and General Manager. The works will probably soon be started.

The contract for the two compound pumping engines, boilers, etc., for the Madisonville (Ohio) water works has been awarded to the Laidlaw & Dunn Co., of Cincinnati. This concern is full of orders and is now adding some large tools.

W. N. Pethick, Assistant Manager, Director of the Imperial Railways, Tientsin, China, requests American manufacturers of railroad equipment to forward copies of catalogues, etc.

The roof of the new terminal station which is being built by the Philadelphia & Reading railroad at Twelfth and Market streets, Philadelphia, containing 150,000 sq. ft., is to be painted with the Dixon Graphite paint furnished by the Jos. Dixon Crucible Company, of Jersey City, N. J.

All the skylight sashes and cornices for the new Reading station at Twelfth and Market streets, Philadelphia are to be of copper, and are furnished by J. S. Thorn, of 1,227 Callowhill street, Philadelphia. The skylights will exceed 100,000 sq. ft.

The Engineerineering Employment Bureau of Syracuse, N. Y., issues a prospectus describing the object of the bureau which furnishes civil, mechanical, mining engineers, etc., architects, superintendents, chemists, instrument men, and draftsmen, free of expence to employers. The agency was established in 1890, W. S. Farrington, C. E., being director. The office is at 8 Granger Block, Syracuse, N. Y.

The Hercules Iron Works of Chicago, have added to their other specialties the manufacture of a new line of forging and bending machines for forging and forming iron and steel. One special feature of their machines is the rapid manufacture of turnbuckles of all sizes. They have also begun the manufacture, and already placed on the market a new design of a light spring hammer, which takes the place of more expensive tools where a hammer with a blow ranging from 15 to 30 lbs. is needed. The hammer is so arranged that one or more can be operated with a single belt. They are to be attached to posts or the side of the shop. Circulars of their tools will be sent on application.

Last March the St. Charles Car Co., through its Assistant General Manager Clarence H. Howard, established and has since been operating a passenger car repair shop at Denver. Since that time it has had all the work this shop could do in rebuilding, repairing and painting narrow and standard gauge cars. About 100 cars have gone through the shop. The results both to the railroad companies and to the car company have been satisfactory, but upon Mr. Howard's resignation, to accept the secretaryship of the Safety Car Heating & Lighting Co., he will close up this Denver shop. The entire management of the works has been in his charge. Mr. Howard will make New York his headquarters after Aug. 1. His western friends regret his leaving the West, but congratulate him upon his new appointment.

New Stations and Shops.

The Great Northern is replacing its freight house at St. Paul, Minn., with a brick structure 500 × 55 ft. Fred. Althen, of St. Paul, has the contract.

The Northern Central has bought the land for extensive transfer yards on the line of its road near Lutherville and Timonium, Md. The new yards are to be built to relieve the present transfer yards at the Mt. Vernon shops.

The plans originally proposed for the new shops of the Gould Coupler Co. at the new town of Depew, near Buffalo, have been materially changed. Architect Geo. J. Metzger expects to have the new plan of specifications ready before Aug. 1.

The Jones Sleeping Car Co., of Denver, has let the contract for the first of the buildings for its proposed new shops to J. H. Ross & Co., of Denver. The building is to be of brick, 40 × 70 ft. It is said that a contract for the machine shops 100 × 250 ft. will be let this month.

The pier of the New York, Lake Erie & Western, on the south side of Pavonia avenue, Jersey City, formerly occupied by the Monarch Steamship Co., is being covered and extended into the river to correspond with the pier on the north side, and when finished will be occupied by the Wilson line of trans-Atlantic steamships.

The Oregon Terminal Co. has just awarded contracts for the erection in Portland, Or., of a 20-stall roundhouse and a freight house 800 ft. long for the use of the Northern Pacific. The roundhouse will be completed in five months and the freight house, costing $65,000, in 90 days. Modified plans for a union passenger station have been approved.

A deputation of Canadian Pacific officials, together with the City Council and members of the Board of Trade of St. Thomas, Ont., on Tuesday last surveyed the Eastern portion of the city with a view to selecting a site for a station, roundhouse and shops. No definite action was taken, but it is understood that the site for the new building was selected.

The Berlin Iron Bridge Co., of East Berlin, Conn., has received the contract for the new tin plate works which Hughes & Patterson are to erect at Philadelphia, Pa. The buildings will be of iron from the designs of the Berlin Co., the main building 40 × 253 ft. long, with a wing 40 × 300 ft., both two stories high, the rolling mill 120 × 160 ft. long, with an annealing room 75 × 160 ft. The whole plant will require about 800 tons of iron to be used in its construction.

The Rail Market.

Steel Rails.—The market is practically unchanged from last week. The mills report a number of small orders, but no information has been given relative to new orders being received. Quotations for standard sections remain about the same, at $30 at Eastern mills and $31 per ton and upward at Chicago.

Track Material.—The quotations for splice bars are the same as last week, 1.70@1.80c. Track bolts, with hexagon nuts, 2.60@2.70c., and spikes at 2.10@2.15c.

The "City of Paris" and "City of New York."

President Griscom, of the International Navigation Co., has completed arrangements with the British government whereby the steamships "City of New York" and "City of Paris" are released by that government from all contracts under which they were held liable for service in the auxiliary navy of Great Britain, in the event of war, and were compelled to remain under an English register and be officered and manned by a British crew. It is expected that the contracts for the two new ships, which must be built in this country, to comply with the law giving these two ships an American registry, will be signed in a few weeks. The new ships will be built at the Cramps' yards at Philadelphia.

The Rock Island's Red River Bridge.

The Red River bridge being erected by the Chicago, Rock Island & Pacific on the line of its southern extension building through the Indian Territory contains six spans of 200 ft. each on concrete piers, which are 60 ft. high from the rock to the top of the pier. The trestle approach is 2,500 ft. The piers are entirely concrete without casing of any kind from the base to the top, and are sunk through about 25 ft. of sand and gravel to the rock. The bridge will not be completed before Oct. 1.

The Toronto Union Station.

The new union station to be built at Toronto, Can., by the Canadian Pacific and the Grand Trunk is to be built on the site of the building now occupied by the Grand Trunk and some adjoining property. Passenger tracks leading into the station from the east and west will, for a considerable distance, be used jointly by the two railroad companies, and the entire property will be managed and maintained under the supervision of a manager to be appointed by the two parties. The city has undertaken to close certain streets and to participate in the expense of an overhead bridge. The arrangement also involves an exchange of properties between the Canadian Pacific and the city. This plan has been arranged after negotiation covering a period of several years between the Canadian Pacific, the Grand Trunk, and the city of Toronto. The new Union Station will be a very handsome building of size and character suited to the importance of the city.

Oscillations of the Washington Monument.

A reporter for a daily paper has recently found in the Washington Monument a subject on which to exercise his notoriously fertile brain and vivid imagination. The monument is credited with a great variety of motions, the most remarkable statement being that the monument is rising. The facts in regard to this appear to be that two observations made by different men several years apart upon rods resting upon iron plates on the top corners of the foundation showed an apparent rise of one side of a very small fraction of an inch. Beyond this a plumb line 174 ft. long, of aluminum bronze wire, about one-twenty-fifth inch in diameter, is suspended in a tube in the monument. Daily observations have been made upon this wire just above the bob by means of two horizontal microscopes, placed at right angles and fitted with micrometers. These observations have been plotted for each week day since the first of February, 1891. From these it appears that the monument is in constant motion, and that its seemingly erratic movements cannot be entirely accounted for by the influence of sun, wind and weather. The records have been carefully preserved and guarded by Gen. Casey, who has been so long in charge of the monument, and a full discussion of the subject is promised when sufficient date have been collected and digested.

Ventilation of the Pennsylvania Tunnel, Baltimore.

The Pennsylvania is preparing to ventilate its tunnel through Baltimore by fans driven by electric motors, the current being transmitted from a power house situated near the North avenue end of the Bolton yard. It is proposed to erect a ventilating stack and fan midway over the northern section. The work was commenced about two months ago, and is to be completed in October. The power house will be a brick structure 40 × 60 ft., with one end of timber covered with corrugated sheet iron, so that the building can be enlarged if necessary. The plant will include an engine, four boilers, generator and the necessary electrical apparatus. The currents for the operation of the fans will be conducted by wires, which can be run through the tunnel or above ground to the ventilating shafts. From this central power house it is also intended to light the tunnels by electricity. The ventilation will be accomplished by building a slanting subway 8 ft. wide by 16 ft. high from the side of the tunnel, near its top, to the foot of the ventilating stack, which, on account of the heavy foundation necessary, will be located at the side of the tunnel. At the foot of the shaft a large fan, fashioned like the blades of a steamboat propeller, will be revolved on a vertical shaft, forcing a strong upward draft. The vacuum created at the middle of the tunnel will cause the smoke and gas to be drawn from the end of the tunnel to its middle, and out the top of the stack. The stacks are to be 100 ft. high and 18 ft. square. Adjoining each stack a small ornamental brick house will be erected for the storage of oil and materials used in operating the system. Owing to the smoke and gas being thrown off at such a great height, and also by reason of the fan through the use of electricity being practically noiseless, the disagreeable features of using boilers and engines are reduced to a minimum. By this system it is expected that the tunnel will be cleared of smoke and gas in less than two minutes after the passage of a train. The Thomson-Houston Electric Light Co., 509 Arch street, Philadelphia, have the contract for all the electrical work, and A. Brann, 1743 North 17th street, Philadelphia, is the contractor for the masonry work, etc.

New York Rapid Transit.

Two weeks ago we were misled into saying that Mr. John Bogart had been made Chief Engineer to the Rapid Transit Commission. The official statement is that he is appointed Consulting Engineer until the franchise is offered for sale. Mr. W. B. Parsons is still in charge of the work, notwithstanding his very severe injuries in the Harrisburg wreck.

The Central of New Jersey Ferryboats.

The following is a brief description of the two double propeller steel ferryboats building by the Harlan & Hollingsworth Co., for the service of the Central Railroad Co. of New Jersey. Dimensions: Length between perpendiculars, 145 ft.; length over all, 158 ft.; beam molded, 32 ft.; width over guards, 54 ft.; depth from base line to underside of deck amidships, 14 ft. The hulls will be constructed of steel, with angle iron deck frames. The motive power will consist of two independent compound surface condensing engines, with cylinders 16 in. and 30 in. diameters by a common stroke of 22 in., supplied with steam by two straight-through type of boilers 8 ft. diameter by 18 ft. long, proportioned for a working pressure of 100 lbs. of steam. The joinery will be two stories high, with a dome skylight over the upper story, and both stories finished in hard wood paneling inside. These boats will be fitted up in the style general in the ferry service in the harbor of New York, and will contain the usual features of construction to render them safe, comfortable and attractive throughout.

THE SCRAP HEAP.

Notes.

A special train of four cars ran from Philadelphia to Washington over the Pennsylvania lines July 17 in 150 minutes, the distance being 140 miles.

The Richmond grain elevator on the line of the Chesapeake & Ohio, in Richmond, Va., caught fire July 18 and was destroyed with its contents. Loss about $100,000. Fully insured.

The last feat of the Empire State Express was to run from Albany to Syracuse on July 18 in 157 minutes, the distance being 148 miles. This is no better time than was made on the special run of Sept. 14, 1891, but the train consisted of five cars instead of three, as in that case.

A water spout at Cañon City, Col., on July 15 washed away a large piece of the track of the Denver & Rio Grande, and dislodged the bridge of the Atchison, Topeka & Santa Fe over the Arkansas River, which was carried down stream against a highway bridge, and both were carried down stream three miles.

A local paper states that two or more men have been discharged from the car shops of the Delaware, Lackawanna & Western, at Dover, N. J., for having signed applications for liquor licenses, the position of the men having been apparently that of guarantors for the applicants. It will be remembered that a warning against this practice was issued by the company to its employés several months ago; at least such a statement was published.

The Board of Public Works, of Newark, N. J., is putting increased pressure on the railroads to abolish the grade crossings in that city. This controversy has been under discussion for several years, and the problem is in some respects as difficult as that at Elizabeth. The Pennsylvania is building a line for its freight trains around the city, and would doubtless be ready to elevate its passenger tracks without delay; but the Newark branch of the Central of New Jersey crosses the Pennsylvania by an overhead bridge close to the station, and any elevation would therefore involve a still further elevation of the Central track.

The strike of miners in the Cœur d'Alene district, Idaho, last week, which resulted in such serious riots that the United States troops had to be called out, was the cause of considerable damage to the railroads. Near Mullan, on the Northern Pacific, on the night of July 14, two railroad bridges were blown up and the telegraph line destroyed, the aim of the miners evidently being to impede the approach of the soldiers. The United States military authorities notified the Union Pacific on the 15th to carry no passengers through the county of Shoshone.

North bound passenger train No. 2 on the Missouri, Kansas & Texas was stopped by robbers on the night of July 14, at Adair, I. T., and the express car rifled. The company had expected an attack and there were eight guards on the train, but it seems that the robbers made the attack further south than had been expected, and they therefore succeeded. A short battle ensued and three of the guards were wounded. The robbers terrorized the town and shot two citizens, one fatally, at a house near the railroad station. It is said that the amount of money taken from the expresscar was less than $3,000. The railroad company offers a reward of $5,000 for each robber, not to exceed $40,000 in all.

Broad Street Station, Philadelphia.

It is announced that the plans for the enlargement of this station, which have been under discussion for a long time, have finally been completed by the architects, Furness, Evans & Co., of Philadelphia. The officers of the road have been in doubt whether to demolish the existing station or to add to it, and have finally decided in favor of the latter plan, and will proceed with construction as soon as possible. The addition will be about as large as the present structure, if not larger, and it will be built of the same material, red brick with terra cotta trimmings, so as to produce a harmonious whole. It will be remembered that the station stands on the west side of the City Hall Square, between Market and Filbert streets. The new building will be ten stories high, and contain offices for the company. This would seem to indicate that the offices in South Fourth street, about half a mile east of the station, are to be moved here. The enlarged station will front 306 ft. to the east (on Broad street), and 212 to the south (on Market street). The building will be about 200 ft. high, with a tower above this, the height of which has not been fully determined.

Each of the eight floors above the second, which is at the track level, will contain from 33 to 40 rooms. The new entrance will be at the southwest corner (Broad and Market streets), and the entrance hall will be 70 ft. deep. The main stairway will be flanked by two passenger elevators which will carry about 50 passengers each. The ticket office, on the Broad street side, will be 20 × 75 ft. The baggage room will be on the north or Filbert street side, 45 × 68 ft.; this will have a large elevator. The main waiting room, on the second floor from the street and on a level with the tracks, will be 82 × 136 ft. The trainshed will be 598 ft. 8½ in. long, 304 ft. wide, and 147 ft. 6 in. high at the highest point. The total length of the head-house and trainshed will be 810 ft. 8½ in. The trainshed will have 16 tracks, being about 50 ft. wider than the new shed at Jersey City.

The company has decided upon another improvement to facilitate the approach to this station, similar to that at Thirty-fifth street, described in the *Railroad Gazette* of Feb. 5 last. The trains of the Philadelphia, Wilmington & Baltimore, which leave the Broad street line at about Thirtieth street, turn to the south, and, of course, cross the eastbound main track. A new track for the outward Baltimore trains is to be built, branching to the right just west of the Schuylkill River; this will then swing around to the left and pass under the main tracks leading to the New York and Western divisions. This plan can be readily carried out, as the track leading to the Philadelphia, Wilmington & Baltimore descends by a steep grade as it leaves the main Broad street line.

A Windy Story.

A number of local capitalists have joined in a plan to give the borough of North Plainfield, N. J., a novel street railroad system. They say that the cars will be of the finest pattern, and the service to the public perfect. The motive power will be the peculiar feature. The rails laid will be hollow, and connected with a compressor at the power station; the air within the rails will be kept under a constant pressure of 2,000 lbs. to the square inch. All along the rails will be valves, eight to each circumference of the wheels, into which there will fit protuberances on the wheels, which open the valves as the car passes, and the compressed air within the rail will be brought to act on the periphery of the wheels just back of the point of contact, which the inventor claims will give the wheels a strong rotary motion. The borough people are entering enthusiastically into the project. Already rights of way through the principal streets have been secured and the work of construction will be immediately begun. The road is to be in successful operation by Oct. 1. It will connect with the electric street railway in Plainfield.—*Evening Post (New York).*

That "takes the cake." The young man who did it ought to be taken right in as a "staff correspondent." His invention is only equaled by his self restraint.

LOCOMOTIVE BUILDING.

The Chicago & West Michigan has ordered four six-wheel switching engines.

The Brooks' Locomotive Works are building a four cylinder compound for the Great Northern.

The New York, Chicago & St. Louis has contracted for 20 engines, and it is understood that the order has gone to the Brooks Locomotive Works.

The Baldwin Locomotive Works is building four locomotives for the Staten Island Rapid Transit road. Three are Forney locomotives and one a standard passen engine.

CAR BUILDING.

The Chicago & West Michigan is in the market for new cars.

The W. P. Ramsey Coal Co., of Philadelphia, will soon order a number of new cars.

The Lake Shore & Michigan Southern last week let a contract for 60 passenger cars.

The Toledo & Ohio Central has placed an order for four new coaches with the Pullman Car Co.

The Chicago & South Side Rapid Transit has ordered a number of new cars, dividing the order between the Jackson & Sharp Co. and the Gilbert Car Co.

The Buffalo, Rochester & Pittsburgh is having 400 cars built by the Berwick Manufacturing Co. and 100 by the Buffalo Car Manufacturing Co., in addition to the 500 cars being built by the Jackson & Woodin Manufacturing Co., noted several weeks ago.

The St. Charles Car Co., owing to greatly increased business, has during the past six months put in new and improved machinery and increased the capacity of the works eight cars a day. The company is at present building 1,000 box cars and 500 coal cars for the Missouri Pacific, contracted for some time ago. The contract for 1,500 cars for the Atchison, Topeka & Sante Fe has been completed, and also for coal and box cars and cabooses for the Missouri, Kansas & Texas.

The passenger plant is also very busy and an additional shop with room for 12 cars is about completed. Recent contracts include 10 day passenger and 10 chair cars for the Missouri Pacific and 10 cars for the St. Louis, Vandalia & Terre Haute. The company is working on coaches for the Wabash, and passenger and baggage cars for the Atchison, Topeka & Sante Fe and the St. Louis & San Francisco. The St. Charles Car Co. never had more work and has never turned out more cars a month than in the last six months.

The Jackson & Sharp Co. is to build for the United States government a postal car, with all modern improvements, for the World's Fair at Chicago, as part of the government postal exhibit. Mr. Job H. Jackson, President of the company, some time ago offered to build a postal car, with all the appliances used on such cars for distributing mail, and place it under the control of the government until after the Fair, and the Post Office authorities have accepted his proposition. The Jackson & Sharp Co. propose to build as handsome a car as possible, which will be equipped with all the devices used in the railroad mail service for the collection and distribution of mail in transit. A portion of the side of the car will be left open and so arranged that visitors will have a clear view of the interior of the car without going inside.

The Staten Island Rapid Transit road has just received from the Jackson & Sharp Co., of Wilmington, Del., a number of suburban cars, which are models of their class. The order included 12 day passenger cars, 4 combination and 8 excursion cars. The principal dimensions are as follows: Length, 54½ ft.; width, 9 ft. 6 in. in frame; length over platforms, 51 ft. 10 in.; height from underside of sill to plate, 7 ft. 4 in.; from under side of sill to top of raised roof, 9 ft. 6¼ in.; height from track to top of raised roof, 12 ft. 8¾ in.; height inside from floor to under side of raised roof, 8 ft. 8 in. These cars are equipped with the Gold system of steam heating, Janney couplers, vacuum brakes and platform gates similar to those on the Manhattan Elevated road in New York City. The cars are painted outside similar to the Royal Blue Line cars. They are finished inside with light mahogany, having veneered ceiling neatly decorated, Hicks & Smith lamps, Manhattan deck sash openers, and the day cars have 12 Hale & Kilburn reversible rattan seats in the centre and seats along the side of the cars, similar to those on the elevated cars, and curtains to the windows. The outside sashes are arranged as in modern parlor cars, with the top light embossed and silvered. The trucks are made light, and have Paige steel tired wheels and steel axles, iron truss brakebeams and flange brakeshoes. The cars have sliding doors, 4 ft. wide, and platforms unusually wide. There are no steps as the platforms are on the same level as the station platforms. The cars seat 54 passengers, and the excursion cars, which are run in eight car trains, can be unloaded in 1½ minutes, even when the cars are carrying 100 passengers, as sometimes happens. Altogether these care are very stylish and attractive.

BRIDGE BUILDING.

Black River, N. Y.—The charter for the Black River Bridge Co., capital stock $3,000, was filed this week. The company is to build an iron bridge over the Black River at Black River. The directors are: Edward W. Remington, of Watertown, William M. Riley, Josiah Burring, Daniel H. Scott, Andrew C. Middleton, Henry C. Dexter, Alexander St. John and Everett A. Dexter, all of Black River.

Fort Madison, Ia.—The bids for the bridge to span the Yahara River on Sherman avenue, in this city, have been rejected and City Engineer Dodge has been directed to ask for new proposals for a plate girder bridge.

Frankfort, Ind.—Proposals are wanted until July 26, for the construction of a wrought-iron bridge, by William B. Hill, engineer.

Grand Trunk.—This company is calling for tenders for the construction of the various iron bridges required on the Great Western division during the year 1892.

High Bridge, Ia.—The Des Moines Northern & Western has let the contract to build a new steel bridge over the Des Moines River at High Bridge, to take the place of the present combination bridge.

Kalamazoo, Mich.—Bids were opened July 14 for the construction of a new iron bridge across the Kalamazoo River. Eleven bids were received, that of the Jackson Bridge & Iron Co., of Jackson, being the lowest at $2,150.

Napa, Col.—The work of tearing down the old bridge across the Napa River at Third street has begun and it is to be replaced by a steel bridge to cost $28,000.

Ottawa, Ont.—County Engineer Lewis is preparing plans for a new iron bridge over the Jacques River at Richmond village. As soon as these are ready the Roads and Bridges committee will call for tenders.

Quinton, Tex.—The Board of Freeholders of Salem County have awarded the contract for building a new iron bridge over Alloway's Creek, at Quinton, to the Berlin Iron Bridge Co. for $5,250.

Richmond, Ont.—The engineer of the County of Carleton, Ont., calls for tenders for the construction of a wrought iron or steel bridge (ready for travel) over the river Jock, in the village of Richmond, Carleton County. The bridge is to consist of one span of 86 ft., clear of abutments. The tenderers are requested to give prices for a bridge of both 16 and 18 ft. clear of roadway, and with side walk 5 ft. wide in the clear. Tenderers must furnish complete plans and specifications. Sealed tenders will also be received for the foundations and the two abutments. Plans and specifications, etc., of masonry may be seen at the office of C. McNab, Ottawa, Ont. Tenders will be received up to July 30.

San Francisco, Cal.—Bids were received as follows for the construction of a steel drawbridge over Channel street, near Fourth: W. H. Norton, $16,500; Union Iron Works, $30,000; T. D. Warwick, $22,500 and $20,700; Darby, Laydon & Co., $17,987; D. McMahon & Son, $16,500; Cotton Bros. & Co., $13,853; Doe, Hunt & Co., $14,990 and $15,200; Tibbitts & Co., $13,125; James J. Searle, $27,000.

Thompsonville, Conn.—The contract for building a steel bridge between this village and Suffield has been awarded to the Berlin Bridge Co., of Berlin. The contract price was $60,000.

Thurston County, Wash.—The San Francisco Bridge Co. has been awarded the contract for building a county bridge having a span of 160 ft. over the Nisqually River, between Pierce and Thurston Counties, Wash., at a cost of $2,700. Bids were received from the following firms: Washington Bridge Co., $2,884 and $2,944; Oregon Bridge Co., $3,856, $3,548 and $2,801; Pacific Bridge Co., $4,034; Hoffman & Bates, $3,134; G. M. Savage & Co., $3,325; E. O'Neil, $3,396; Frank Cantara, $5,770 and $5,880; D. D. Clark, $3,648; J. S. Frace, $3,579; San Francisco Bridge Co., $2,800 and $2,700; W. V. Harnaday, $2,600.

Washington, D. C.—The President has signed the act granting the Aransas Harbor Terminal Railroad the right to construct a bridge across the Corpus Christi channel, in Aransas County, Tex.; the bill amending the act authorizing the Oregon & Washington Bridge Co. to construct a bridge across the Columbia River between Washington and Oregon.

Winnipeg.—Plans for the iron bridge over the Red River to connect the Norwood property with the city have been approved after a long delay, and the work of construction will be commenced soon, probably in August.

RAILROAD LAW—NOTES OF DECISIONS.

Powers, Liabilities and Regulation of Railroads.

In Pennsylvania the Federal Court holds that under the statute of 1849, imposing upon the president and directors of a railroad company the duty of locating its road, this duty cannot be delegated to an executive committee appointed under the by-laws to have "general supervision of the operations and policy of the company," with power to authorize its officers to execute "such contracts and agreements" as the committee may deem expedient; and a location made by such committee is void, as against a subsequent location on the same ground by the directors of another company having the right of eminent domain.[1]

In New Hampshire, it is decided that a covenant in a railroad lease not to assign or sublet is broken when the lessee executes a lease of its own road, and all roads leased or operated by it, especially excepting those which cannot be legally assigned or sublet, but further providing that "the lessor covenants that if it be found impracticable to at once deliver immediate possession of any railroad leased or operated by it at the inception of this lease, by reason of any agreement to the contrary or other reason, it will use all reasonable efforts to deliver, and will deliver possession thereof as soon as practicable," and that "the lessor shall meanwhile continue in the possession of such railroad, and under the direction of the lessee, in all respects, shall continue to use and operate the same under its contract with the company owning the same, and to pay the rental or other consideration agreed to be paid for the use of the same, and to receive the earnings thereof, but shall immediately transfer and pay over all such earnings to the lessee to its own use, which in consideration thereof shall reimburse the lessor for all expenditures, and indemnify and hold it harmless against all costs, claims and liabilities arising out of the lessor's possession and operation of said railroad." Three judges dissented from this conclusion.[2]

The Supreme Court of California rules that the provision of the code that after beginning the construction of its road a railroad must complete, every year, at least five miles of the road, under penalty of forfeiture of the right to extend its road beyond the point completed, does not apply to the construction of side tracks.[3]

In Indiana the Supreme Court holds that a grant of authority to a city to appropriate lands for the purpose of a street will authorize the construction of a street across a railroad.[4]

The Supreme Court of Utah rules that the claims of the operators of a railroad for work performed 60 days next preceding the appointment of a receiver are entitled to priority over a trust deed on the company's property, since such work is done for the benefit of the mortgagees and to preserve the mortgaged property.[5]

In Kentucky the Court of Appeals decided that a railroad cannot, by granting to one person the exclusive privilege of standing hacks at the platform of its depot, prevent other persons from bringing their hacks into the depot grounds, and soliciting for the carriage of passengers from the depot, so long as they do not interfere with the company's business.[1]

In Texas the Supreme Court rules that an order by the United States Circuit Court, which appointed a Receiver for a railroad company, discharging him, and returning the property to the company, and providing that the property shall be relieved from any liability on claims not established by intervention in the suit in which the Receiver was appointed, cannot affect the company's liability for injuries to a passenger while the road was in the Receiver's hands, the Receiver having used in improvements sufficient earnings to pay the claim, nor prevent such passenger from enforcing his claim against the company by suit in the State court.[2]

Injuries to Passengers, Employes and Strangers.

In Texas the Supreme Court rules that a person who goes to a station to meet a friend expected on the train, and to get on the train in case his friend is aboard, is not a trespasser, but is entitled to receive the protection of ordinary care from the company.[3]

[1] Weidenfeld v. Sugar Run R. Co., 48 Fed. Rep., 615.
[2] B. C. & M. R. Co. v. B. & L. R. Co., 23 Atl., Rep., 529.
[3] Town of Arcata v. Arcata & M. R. R. Co., 28 Pac. Rep., 676.
[4] Lake Erie & W. R. Co. v. City of Kokomo, 29 N. E. Rep., 780.
[5] Litzenberg v. Jarvis-Conklin M. T. Co., 28 Pac. Rep., 871.
[6] McConnell v. Pedigo, 18 S. W. Rep., 15.
[7] Tex. & Pac. R. Co. v. Watts, 18 S. W. Rep., 312.
[8] Texas & Pac. Ry. Co. v. Best, 18 S. W. Rep., 224.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Buffalo, Rochester & Pittsburgh, quarterly, 1¼ per cent. on the preferred stock, payable Aug. 15.

Central Pacific, 1 per cent., payable Aug. 1.

Great Northern, quarterly, 1¼ per cent. on the preferred stock, payable Aug. 1.

Lake Erie & Western, quarterly, 1¼ per cent. on the preferred stock, payable Aug. 15.

Mill Creek & Mine Hill Navigation, 5 per cent., payable on demand.

Mount Carbon & Port Carbon, 2½ per cent., payable on demand.

Schuylkill Valley Navigation, 2½ per cent., payable on demand.

Toledo & Ohio Central, quarterly, 1 per cent. on the common stock, payable Aug. 25.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Chicago & West Michigan, special, Grand Rapids, Mich., Aug. 16, to authorize the purchase of the Chicago & North Michigan.

Boston, Hoosac Tunnel & Western, annual, Saratoga Springs, N. Y., Aug. 17, for the election of directors and to consider the consolidation with the Fitchburg.

Toronto, Hamilton & Buffalo, special, Aug. 9.

Upper Coos, Lancaster, N. H., Aug. 16.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *New England Railroad Club* holds regular meetings, at the United States Hotel, Beach street, Boston, Mass., on the second Monday of each alternate month commencing January.

The *Western Railway Club* holds regular meetings on the third Tuesday in each month, except June, July and August, at the rooms of the Central Traffic Association in the Rookery Building, Chicago, at 2 p. m.

The *New York Railroad Club* holds regular meetings on the third Thursday in each month, at the rooms of the American Society of Mechanical Engineers, 12 West Thirty-first street, New York City, N. Y. The next meeting will be Sept. 15.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, the fourth Wednesday of January, March, May, September and November.

The *Northwest Railroad Club* meets on the first Saturday of each month, except June, July and August, in the St. Paul Union Station, at 7:30 p. m.

The *Northwestern Track and Bridge Association* meets on the Friday following the second Wednesday of March, June, September and December, at 2:30 p. m. in the directors' room of the St. Paul Union Station.

The *American Society of Civil Engineers* holds its regular meetings on the first and third Wednesday in each month, at the House of the Society, 127 East Twenty-third street, New York.

The *Boston Society of Civil Engineers* holds its regular meetings at the American House, Boston, at 7:30 p. m., on the third Wednesday in each month.

The *Western Society of Engineers* holds its regular meetings at 78 La Salle street, Chicago, at 8 p. m., on the first Wednesday in each month.

The *Engineers' Club of St. Louis* holds regular meetings in the club's room, Laclede Building, corner Fourth and Olive streets, St. Louis, on the first and third Wednesday in each month.

The *Engineers' Club of Philadelphia* holds regular meetings at the House of the Club, 1,122 Girard street, Philadelphia, on the first and third Saturday of each month. The annual meeting is held on the third Saturday in January. The club stands adjourned during the months of July, August and September.

The *Engineers' Society of Western Pennsylvania* holds regular meetings on the third Tuesday in each month, at 7:30 p. m., at its rooms in the Thaw Mansion, Fifth street, Pittsburgh, Pa.

The *Engineers' Club of Cincinnati* holds its regular meetings at 8 p. m. on the third Thursday of each month in the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati.

The *Civil Engineers' Club of Cleveland* holds regular meetings on the second Tuesday of each month, at 8 p. m., in the Case Library Building, Cleveland. Semi-monthly meetings are held on the fourth Tuesday of the month.

The *Engineers' Club of Kansas City* meets in Room 200, Baird Building, Kansas City, Mo., on the second Monday in each month.

The *Engineering Association of the South* holds its monthly meetings on the second Thursday at 8 p. m. The Association headquarters are at Nos. 63 and 64 Baxter Court, Nashville, Tenn.

The *Denver Society of Civil Engineers and Architects* holds regular meetings at 36 Jacobson Block, Denver, Col., on the second and fourth Tuesday of each month, at 8 o'clock p. m., except during June, July and August, when they are held on the second Tuesday only.

The *Civil Engineers' Society of St. Paul* meets at St. Paul. Minn., on the first Monday in each month.

The *Montana Society of Civil Engineers* meets at Helena, Mont., at 7:30 p. m., on the third Saturday in each month.

The *Civil Engineers' Association of Kansas* holds regular meetings at Wichita on the second Wednesday of each month at 7:30 p. m.

The *American Society of Swedish Engineers* holds meetings at the club house, 250 Union street, Brooklyn, N. Y., and at 347 North Ninth street, Philadelphia, on the first Saturday of each month.

The *Engineers' Club of Minneapolis* meets the first Thursday of each month in the Public Library Building, Minneapolis, Minn.

The *Canadian Society of Civil Engineers* holds regular meetings at its rooms, 112 Mansfield street, Montreal, P. Que., every alternate Thursday except during the months of June, July, August and September.

The *Association of Civil Engineers of Dallas* meets at 803 Commerce street, Dallas, Tex., on the first Friday of each month at 4 o'clock p. m.

The *Technical Society of the Pacific Coast* holds regular meetings at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., at 8 o'clock p. m. on the first Friday of each month.

The *Tacoma Society of Civil Engineers and Architects* holds regular meetings on the third Friday of each month, in its rooms, 201 and 202 Washington Building, Tacoma, Wash.

The *Engineers and Architects' Club of Louisville* holds regular meetings on the second Thursday of each month, at 8 o'clock p. m., at its rooms in the Norton Building, Louisville, Ky.

The *Association of Engineers of Virginia* holds regular meetings at Roanoke, on the second Saturday in each month, at 8 p. m., except the months of July and August.

Engineering Association of the South.

The regular June meeting of the Engineering Association of the South was held at the Association headquarters in Nashville, Tenn., on Thursday evening June 9, 1892, with Vice-President James Geddes presiding.

After consideration, it was decided to hold the regular meetings of the Association on the regular dates, viz., the second Thursday evening of each month and not to suspend during the summer as heretofore.

The paper of the evening, entitled "Notes on Mine Surveying," was read by Mr. Benjamin W. Robinson, Mining Engineer of the St. Bernard Coal Co., of Earlington, Ky. The paper called attention to the rapid advances in mining during the past few years and in the general adoption of more scientific methods; and that the work of mine surveying proper had not received the attention its importance warranted, either in standards of precision or in reliability of results. Tunnel surveying had reached a high state of perfection simply because of the high standards demanded. The author considered as essential to good work, the following outfit: The complete mining transit arranged for vertical sighting and provided with extension tripod, vertical circle with bubble on telescope and stadia wires for outside topography, also a sensitive needle for checking vernier angles. Steel tapes should be used for linear measurement and plummet lamps for sighting. The old compass and the link chain should be discarded for mining work. The author outlined a desirable system for an underground survey with manner of connecting it with the surface system. Important points in the underground system should be duplicated on the surface and monumented.

The regular July meeting was held on the evening of July 14, Col. H. M. Robert, U. S. A., presided.

W. W. Carson, of Knoxville, read a paper on the Mississippi River problem. He suggested that every interest in the nation, and, indeed, in the civilized world, would profit by the solution of it. He spoke briefly of the caving in of the banks of the Mississippi River by the acre; of the vast amount of silt borne by the stream while in flood, and of the heavy deposits which occur where the current is retarded. He spoke of the fact that the high water current often flows across the low water channel, and stated that, in places where this occurs, the deposits of silt often entirely fill up the low water channels. The bed of the river is not fixed; cut-offs, measured by tens of miles, sometimes occur, and the river at places shifts itself sideways more than 1,000 ft. in a single year. Any effective solution of the navigation problem would incidentally furnish perfect protection from floods. Failures in levees were due to lack of size. Levees, built too small for lack of money, were not re-enforced, since the next year's taxes had to be used in replacing levees caved into the river. To secure good navigation the river must be forced to flush itself by flowing always along the same channel. This could only be brought about by levees, and these must be placed right on the banks. Some people might ask about the waterway, but those who knew the river, and had seen it carve new channels of its own volition, could never doubt it would give itself all needed waterway by going down, if kept from going sideways. Since the levees should be placed on the banks the caving should be prevented. Moreover, the holding of the banks would cut off the supply of detritus and this, of itself, would almost arrest further shoaling. This, then, is the key to the problem. Only two ways of holding caving banks are so far known; that of carpeting the submerged slope with mats of brush; and that of building huge spur dikes 500 to 1,000 feet apart. Both processes are very costly, and so another method is much to be desired. He here proposed a plan, devised by himself, which he thought would reduce the cost by 30 per cent. In the discussion which followed the reading of the paper he even intimated that the saving in cost might sometimes be more than that. In building a spur-dike, he proposed to use large wooden crates, trussed like a bridge, about 50 feet long and 10 or 12 feet wide and deep. After weighting each of these with about 30 yards of earth, he would sink them during low water with their lengths parallel to the current, thus building the spur-dike of the desired size and shape. He claimed that the current, in passing through these crates, would be so retarded by the chords and braces, aided by the chamber containing the earth used for sinking, that it would fill the crates with silt. He said that a block of silt measuring 50 ft. in the direction of the current could not be slided by any current of the Mississippi. Trusses of crates to be used in exposed positions might be made plate-girder-like, to prevent the washing away of deposited silt. He favored, however, another kind of protection. He would build a series of pavements about 50 or 100 ft. apart, measured with the current, through the submerged slope of the bank. These pavements should be made of blocks of silt 50 or 70 ft. long, placed parallel to the current as in the other case. These blocks, likewise encased in trussed crates, should be about 5 ft. deep and 16 ft. wide. He exhibited blue prints showing how these crates could be framed and put together with wooden pins alone, and showing a spur-dike and a pavement made of the crated blocks of silt.

The Civil Engineers' Club of Cleveland.

The regular meeting was held in the club rooms July 12. The committee appointed to take action on the death of John Whitelaw, ex-President of the club, and for many years Superintendent of the Cleveland Water Works, made their report. Wendell Phillips Brown was elected an active member. The paper of the evening was read by Dr. C. S. Howe, of Case School of Applied Science, on the subject, "A Mathematical Discussion of Some Census Reports, with Special Application to the Population of Cleveland, Past and Future." The formula $P = A + Bt + Ct^2 + Dt^3$, where t represents the time after a certain fixed date, A, B, C and D are constants to be determined and P represents the population at the point 0 was assumed and the constants determined from the census reports of the population of Cleveland from 1820 to 18-0. Using the formula the population was predicted for 1890 and agreed with the census report within 539. A new formula was then constructed, including the data for 1890 and the population predicted for the future. The final formula was $P = 18{,}012.5 + 18{,}790.9\,t + 6{,}998.2\,t^2 + 877.3\,t^3$. Using this formula the predicted population for 1900 was 396,587; 1910, 572,196; 1930, 1,065,417; 2000, 4,835,461. The formula showed that Cleveland had never experienced a boom, but had had a strong, steady growth.

The Southern Railway and Steamship Association.

The association held its annual meeting at the Oriental Hotel, Coney Island, N. Y., last week. Some changes were made in the agreement which give more power to the Commissioners and Executive Committee in the enforcement of rates. It was signed by only 22 of the 30 companies represented, but the others are expected to come in. Should they not do so by Aug. 31, the Commissioner will call a special meeting to consider the advisability of continuing the association. The officers of the association elected for the ensuing year are: President, Joseph E. Brown; Vice-President, John W. Thomas, President of the Nashville, Chattanooga & St. Louis. E. B. Stahlman, of Nashville, was re-elected Commissioner, and A. Pope, Secretary.

PERSONAL.

—President John Newell, of the Lake Shore & Michigan Southern, sailed for Europe last week, to be absent a month.

—Mr. George W. Clymans, General Baggage Agent of the West Shore, died at Tappan, N. Y., this week, aged 51 years.

—Mr. George L. Kingland, for the past two years President of the George's Creek & Cumberland Railroad, died at his home at Babylon, L. I., July 13, aged 65 years.

—Mr. Walter P. Emmerson, Soliciting Freight Agent of Louisville, New Orleans & Texas, has been appointed Secretary of the New Orleans Traffic Association, to succeed the late M. N. Coe. He is now about 31 years of age.

—Mr. J. F. Young has been appointed Chief Engineer of the Johnsonburg & Bradford, succeeding Mr. J. M. Floesch, transferred to the Clearfield & Mahoning, both of which roads are under construction by the Buffalo, Rochester & Pittsburgh.

—Mr. William Patterson, Superintendent of the St. Charles Car Shops, died at St. Charles, Mo., last week. Mr. Patterson assumed this position with the shops about eighteen months ago. He was previously Master Car Builder of the Atchison, Topeka & Santa Fe.

— Hon. Frederick W. Hoyt, President of the Duluth Red Wing & Southern, died suddenly at his residence at Red Wing, Minn., on July 13. Mr. Hoyt was interested in various manufacturing and financial institutions, and was regarded as the foremost citizen of his city. He was several times a member of the lower house of the Minnesota legislature.

—Mr. R. W. Davis has been appointed General Freight Agent of the Buffalo, Rochester & Pittsburgh, and E. C. Lapey has been appointed General Passenger Agent of the same road. These appointments are owing to the resignation of Mr. J. P. Thompson. Mr. Davis became connected with the Buffalo, Rochester & Pittsburgh 10 years ago as train dispatcher; later he was promoted to Traveling Freight Agent and also chief clerk of the freight department, and for some time he has been assistant to the President. Mr. E. C. Lapey, who became General Passenger Agent, entered the service of the company in 1882 also, as chief clerk of the passenger department, the duties of Traveling Passenger Agent being afterwards added.

—Mr. Joseph P. Thompson, who, as announced last week, has resigned as General Freight and Passenger Agent of the Buffalo, Rochester & Pittsburgh, has held that office about five years and was formerly Division Freight Agent of the New York, Lake Erie & Western. Mr. Thompson has been in poor health for over a year and he has started on a long vacation in the hope of improving his health. He has been in railroad service since 1872, and has been successively Chief Engineer in the general freight office of the Burlington, and General Freight Agent of the Chicago & Paducah, and General Freight & Passenger Agent of the Atchison & Nebraska. In 1878 he was appointed Agent of the Erie at Newark, and Division Freight Agent in 1886.

ELECTIONS AND APPOINTMENTS.

Atlanta & Florida.—T. W. Garrett has, as Receiver, taken possession of all the property of the railroad company, and announces the following officers as in charge of the operations of the road: Robert F. Maddox, Jr., Treasurer; W. E. Alger, Auditor; H. M. Cottingham, General Freight and Passenger Agent, and John H. Humphries, Master of Transportation. The general offices are at Atlanta.

Buffalo, Rochester & Pittsburgh.—J. P. Thompson, General Freight and Passenger Agent of this company,

having resigned, the following appointments are made: R. W. Davis, General Freight Agent, and E. C. Lapey, General Passenger Agent.

Central of Georgia.—W. A. Moore, who has been Roadmaster of the South Bound has been appointed Roadmaster of the Columbus & Western to succeed Edward Ford, who resigned to accept the office of Superintendent of the South Bound road. Mr. Moore's headquarters will be in Columbus, Ga.

W. P. Epperson, formerly Trainmaster of the South Bound road, has been appointed Master of Trains of the Chattanooga, Rome & Columbus. He is a son of B. P. Epperson, Superintendent of the Southwestern divison of this road, and who, by inadvertence, was reported last week to have been appointed Superintendent of the Chattanooga, Rome & Columbus.

Chicago & West Michigan.—H. J. Broderick has been appointed Ticket Accountant, vice J. S. Willebrands, assigned other duties. His office is at Grand Rapids, Mich.

Colorado Midland.—E. R. Ingersoll, City Freight Agent at Denver, has been promoted to be General Agent at San Francisco. H. P. Martin, Traveling Freight and Passenger Agent succeeds Mr. Ingersoll at Denver.

Corinne, Malad Valley & Northern.—The first directors of this Utah Company are: Francis E. Roche, H. M. Jarvis, Thomas D. Pitts, Lewis D. Zenor and Austin C. Sloan. The incorporators are: J. N. Guthrie, Henry M. Jarvis, Thomas D. Pitt, Austin C. Sloan, L. D. Zenor, R. S. Guthrie, of Corinne, Utah; F. E. Roche, F. A. E. Roche, Lakeside Ranch; E. P. Johnson, Eagle Farm.

East Louisiana.—At the annual meeting of the stockholders, held in Covington, La., July 14, the following were elected directors: John Poitevent, J. A. Favre, Phillip A. Orr, E. Martelli and Adolph Poitevent. Capt. John Poitevant was elected President; Capt. Joseph A. Favre, Vice-President; Philip A. Orr, secretary, and E. Martelli, Treasurer.

Girardsville.—Henry D. Welsh, Philadelphia, is President of this company, and the directors are John P. Green, Samuel Rea, William A. Patton, Joseph U. Crawford, P. B. Prince, F. W. Swarz, officers of the Pennsylvania.

Great Northern.—Taking effect Aug. 1, the line from Great Falls to Pacific Junction and the branches from Great Falls to the Boston & Montana smelter and the Montana smelter will be operated by the Montana Central for the account of the Great Northern. The jurisdiction of L. E. Johnson, Superintendent of the Montana Central, with headquarters at Great Falls, will be extended over those lines. The Montana Division will be extended from Pacific Junction to Blackfoot, and will be in charge of J. A. Mayer, Superintendent, with headquarters at Havre, Mont. H. W. Edwards has been appointed Engineer of Maintenance of Way of the Western Division, with headquarters at Spokane, Wash.

H. W. Edwards, has been appointed Engineer of Maintenance of the Western Division.

International & Great Northern.—T. M. Campbell, recently Receiver, has been appointed General Manager, and A. R. Howard, formerly cashier, has been appointed Treasurer, both with headquarters at Palestine, Texas.

Lafayette & Monon.—The following are the first directors of this company: J. M. Reynolds, Adams Eard, James Murdock, R. W. Sample, W. F. Stillwell, S. C. Curtis, Wm. Ross, J. M. Fowler, John Levering, John P. Gagen, J. H. Wilson and Adam Herzog, of Lafayette, Ind.

Maine Central.—L. A. Hall, Chief Train Despatcher, has been appointed Assistant Superintendent, with headquarters at Portland, Me.

Mexican Northern Pacific.—The following were named as directors in the charter filed in New Mexico last week: William H. Davis, Chicago; H. L. Warren, Albuquerque, N. Mex.; G. Wormser, Deming, N. Mex.; E. E. Barrett, Chicago, and D. J. Cable, Lima, O., Treasurer.

Nashville, Tellico & Charleston.—The incorporators are James P. McDonald, J. C. Anderson, Jackson Smith, W. Kenefick and William P. Denor, all of Knoxville, Tenn.

Philadelphia Belt Line—The following are the officers of the company: Francis B. Reeves, President, and John J. Curley, Secretary, room No. 30 Merchants Exchange, Philadelphia, and John A. Wilson, Chief Engineer, 1056 Drexel Building, Philadelphia.

Pine Bluff & Eastern—The incorporators are F. M. Gillette, New York; H. E. Martin, Stuttgart, Ark.; John M. Taylor, A. V. Stafford and John O'Connell, Pine Bluff, Ark. A. V. Stafford is General Manager.

Richmond & Danville.—Alexander S. Thweatt has been appointed Eastern Passenger Agent, with headquarters at No. 229 Broadway, New York City, succeeding E. I. Cordner, who resigned last week. He was formerly District Passenger Agent for the company at Chattanooga, but was recently transferred to Atlanta. W. H. Taylor has been appointed District Passenger Agent for the line between Atlanta and Chattanooga, with headquarters at the former city. His appointment takes effect July 15.

St. Louis Southwestern.—D. Mills has been appointed Superintendent of Car Service, vice J. W. Dickenson, transferred to be Superintendent of the lines in Texas and of the Tyler Southeastern. Mr. Mills' headquarters will be at Pine Bluff, Ark.

Savannah, Americus & Montgomery.—H. B. Byrne, General Agent for the Central of Georgia, at New Orleans, has been appointed General Eastern Agent of this company, with office in New York.

South Bound.—Superintendent Edward Ford has issued an order, effective July 10, appointing Virgil Walker Master of Trains of that road, vice W. P. Epperson, resigned.

Union Pacific.—P. Douglass, Jr., has been appointed General Agent at New Orleans, La., succeeding F. B. Aglar, who recently resigned. He has been Assistant Agent for some time, being now about 25 years of age.

A. J. Bane has been appointed Assistant Superintendent, with jurisdiction over the lines in Oregon, and M. J. O'Brien, Assistant Superintendent, with jurisdiction over the lines in Washington. R. W. Baxter is now General Superintendent of the Pacific Division, with office in Portland, Or.

Utah, Nevada & California.—The following are the directors named in the charter filed in Utah last week. Francis Tiernan, Joseph G. Jacobs, Edwin I. Thorn, William H Donnell, John J. Stewart, Frank Harris, Arthur B. Witcher, of Salt Lake City, and George E. Hicks, of New York. The new officers are: President, Francis Tiernan; Vice-President, E. I. Thorn; Secretary, J. J. Stewart; Treasurer, J. G. Jacobs.

Wheeling Bridge & Terminal.—The appointment of Otto Schroll noticed last week should have been given as Engineer of the Maintenance of Way instead of Assistant Engineer. His office is at Eighteenth and Chapline streets, Wheeling, W. Va.

RAILROAD CONSTRUCTION.
Incorporations, Surveys, Etc.

Aransas Pass Terminal.—The charter of this company will soon be filed in Texas. The company proposes to build a road from the mainland at Aransas harbor to deep water at Aransas Pass, 9¾ miles long. The capital stock is $250,000, and $60,000 has been already expended on the work. John W. Maddox, E. Nelson and others are incorporators.

Astoria & Portland.—C. W. Schofield, one of the contractors, says that grading has been completed to a point 17 miles from Astoria, Or., and the contractors are crowding the work as fast as possible. They will begin laying rails next month. Work has been begun on the tunnel through the mountains, about 30 miles from Astoria. It will be some time before the tunnel is completed. The company at Fairmount this summer has given a mortgage to the Mercantile Trust Co., of New York, for $10,000,000.

Boise City & Butte.—O. L. Miller, of Boise City, Idaho, promoter of this proposed road, has recently returned to Boise City from New York, and is organizing a corps of engineers for a permanent survey of the road. Mr. Miller completed a reconnoissance from Boise north to Butte, Mont., about 400 miles this spring. The maximum grade is two per cent.

Canadian Pacific.—G. H. Strevel, contractor, reports that he has orders to have the grading completed on the Pipestone branch, so that the line may be finished by Aug. 15. This branch is being extended west of Monteith, Man., for 33 miles.

Cape Breton.—It is understood that work of construction will commence at once on the road from McIntyre's Lake to Louisburg. Mr. Paint is said to have succeeded in interesting a company of American capitalists in his project.

Chicago, Rock Island & Pacific.—Engineers began a resurvey a few weeks ago of the projected line from Lincoln southwest to Jansen, Neb., on the line between Beatrice and Fairbury. The distance is about 45 miles. Two years ago the company had surveys made for a line from Lincoln to Jansen, and the surveys now being made are for the purpose of changing this line so as to make over or under crossings of all the railroads which may be crossed between those points. The company has purchased property for a station and yards in East Lincoln, which will probably be built this fall.

On the Southern or Texas extension the grading is completed on 104 miles south of Minco, Ind. Ter., or to the Red River, and track will be laid on this by Aug. 15. The contractors are now grading from the river to Bowie, Tex., about 24 miles.

Chicago, Rock Island & Texas.—This company was organized at Bowie, Tex., on July 12, by J. H. Matthews and Z. T. Lowrie, of that town. Application has been made for a charter for a line from the Red River south toward Fort Worth, passing through the counties of Montague, Wise and Parker, connecting with the southern extension of the Chicago, Rock Island & Pacific, now being built.

Coburg, Northumberland & Pacific.—A meeting of the provincial directors was held last week; two offers to build the road were received. A committee was appointed to consider tenders for construction which will meet in Peterborough, Ont., shortly to report to an adjourned meeting of the directors. H. K. Wickstead, of Coburg, Ont., is Chief Engineer of the company.

Corinne, Malad Valley & Northern.—Articles of incorporation were filed in Utah last week. The object of the company is to build a road from Corinne City to Butte, Mont., the principal place of business being at Corinne, Utah. The capital stock is $3,000,000. The road will pass through Box Elder county, Utah; Oneida, Cassia, Logan, Alturas, Custer and Lemhi counties, Idaho, and Beaverhead and Silver Bow counties in Montana. The length of the road is 400 miles. A surveying party in charge of Charles Nicolet has left Corinne City to locate and cross-section the line as far as Malad City, and the right of way from Corinne City to Malad is said to be already secured.

Cumberland Valley.—The recent reports that engineers were surveying for a new line to the Broad Top coal fields have for a basis the fact that the company is retracing the line run about two years ago to Mount Dallas, in Bedford County, about 35 miles west of Richmond, a station near the western terminus of the Southern Pennsylvania branch.

Duluth, Pierre & Black Hills.—The contract has recently been let for grading about 15 miles of the uncompleted section between Faulkton and Pierre, South Dakota. The report that the contract has been awarded for all the work between Faulkton and Blunt east of Pierre seems to have been premature, but the officers expect to have all this work under contract soon and to complete the section this year. James A. Ward, of Pierre, is General Manager.

Evansville & Richmond.—It is stated that right of way has been secured east of Westport, Ind., the present terminus, toward Richmond, and that work will soon be commenced on the proposed extension to the latter town.

Florence, Cripple Creek & State Line.—J. B. Orman & Co., of Pueblo, have been awarded the contract for the grading of this road from Florence, Col., north to the Cripple Creek mines. The grading is to begin on both ends of the route before Aug. 1 and the officers state that the road will be in operation in November. The estimate made by the officers of the cost of the construction places it at over $600,000. J. M. McCandless, of Florence, is President and Isaac Canfield, Secretary.

Girardsville.—A charter was granted to this company this week. The line is to be five miles long, to extend from Shenandoah to Girardville, in Schuylkill County, connecting the Shenandoah branch of the Pennsylvania Schuylkill Valley road with Girardville. The capital is $50,000. Henry D. Welsh, Philadelphia, is President, and the directors are other officers of the Pennsylvania road.

Gouverneur & Oswegatchie.—The contractor has about 400 men working on the line east of Gouverneur, N. Y., and the work has begun also at Hillsboro. The grading force is being increased and Moffett, Hodgkins & Clarke, of Syracuse, who have the contract for this work, expect to complete the line to Edwards, N. Y., 15 miles, by July 1.

Great Northern.—The right of way dispute with the Northern Pacific regarding property at Spokane, Wash., has been settled, and work has been resumed through Spokane west of the Seattle, Lake Shore & Eastern track. As soon as this grading is finished the line will be ready for the track to the crossing of the Columbia River. The track-laying will be resumed this week.

Green Bay, Winona & St. Paul.—It has not yet been decided whether the line from Merrillan to St. Paul will be built this year. General Manager Champion and Superintendent Seymour have driven over 54 miles of the proposed line from Merrillon and Durand, and report the location to be an excellent one.

Gulf & Ship Island.—T. J. Stewart, of Gulf Port, Miss., has made an agreement with James A. Swan, a railroad contractor, to repair the roadbed and operate the line for the Receiver until the court decides the receivership case, which will probably be done in August.

Indianapolis, Logansport & Chattanooga.—F. L. Patrick, of Columbus, O., the promoter of this road, stated, in an interview last week, that he had secured the right of way, except nine miles, from Indianapolis south to Rockport, Ind., on the Ohio River. The directors will meet at Indianapolis next week, he says, to arrange for the commencement of the work. The grading he expects to begin in a month.

Mason City Terminal.—At an election at Mason City on July 12 a three per cent. tax was voted in aid of the construction of this road, which is to extend from Mason City north to Manly Junction, Ia., about 12 miles, to connect with the branch of the Chicago Great Western terminating at that point. It is also proposed to build to Forest City. Hamilton Brown, of Fort Dodge, is the projector of the road.

Mexican International.—Track laying on the Durango extension has been stopped for two weeks on account of the non arrival of necessary material. The road is now completed to within 40 miles of the city of Durango, Mex. The grading outfits are being transferred as fast as they finish their contracts, to Monclova, where they are given work on the Sierra Mojada extension.

Mexican & Northern Pacific.—The charter for this company was filed at Santa Fe, New Mex., July 15, the company being organized to complete the 35 miles of road from Deming south to the Mexican boundary line. The grading for this section was practically finished in 1890. Some track has been laid south of Deming.

Mexico, Cuernavaca & Pacific.—Connections have been made with the Mexican Central road, near Nonoalco, just outside Buena Vista, Mex., and construction trains are running on the new road. Major Butman, Chief Engineer, has closed a contract for 20,000 ties, which are being delivered along the line near the city of Mexico.

Middlesex Valley.—Work on this road is being pushed rapidly. The first construction train passed through Rushville this week. Half of the track has been laid from Stanley southeast to Naples, N. Y., about 20 miles.

Milwaukee & Northern.—McIntosh Bros., of Milwaukee, who have the contract for the 50-mile extension from near Sagola northwest to Sidnaw, Mich., on the Ontonagon & Brule branch, have about 1,000 men engaged on the line, and the work is now well under way. The sub-contractors are as follows: Cahill & Strong, Ferguson Bros., McDougall & Beacom, John Fields, Anderson & Brustrom, H. Neal, H. C. Chapman and N. Carlson & Co. The headquarters of McIntosh Bros. are at Crystal Falls, Mich.

Missouri, Kansas & Texas.—A new survey has just been started for the Houston extension, and three lines are to be run east of Boggy Tank to Houston. The work is in charge of F. W. Fratt.

Nashville, Tellico & Charleston.—The route of this road, as given in the charter filed in Tennessee last week, is as follows: Nashville to Athens, in McMinn County, thence through McMinn and Monroe counties to the North Carolina state line, at the most convenient point to connect with the line of railroad to Charleston, S. C. James P. McDonald and William Kenefick, of Knoxville, Tenn., are among the directors.

Oshawa.—The town council of Oshawa, Ont., held a special meeting on Monday last, and decided to submit the by-law granting $15,000 to this company to a vote of the people on Aug. 9.

Ottawa, Amprior & Parry Sound.—M. E. Fauquier, of Toronto, contractor for the 39-mile section between Graham's Bay and Amprior, Ont., has arrived in Ottawa. The company's engineers are now completing final arrangements for the right of way, and as soon as these have been settled the contractor will begin work. Mr. Fauquier said he would put on all the hands and machinery necessary to push the contract through by the fall, and that owing to the comparatively easy nature of the work he would have it completed well within the specified time.

Ottawa & Gatineau Valley.—The Government Inspector passed over this road from Wakefield to Farrelton, Que., last week and reported favorably. The line is now completed for 40 miles north of Hull, opposite Ottawa.

Pan American.—An excursion was made over the completed portion of this road on July 13, from Victoria, Tex., to the crossing of the Gaudalupe River, 10 miles south of the town. This section is through an agricultural country growing corn, grain and cotton. The tracklaying has been suspended, and J. H. Barrett, the contractor, has removed his grading outfit.

Philadelphia Belt Line.—About 2½ miles of this line is now built and track laid, the end of track on the north being at Bridesburg. The company is endeavoring to secure an ordinance to permit it to build a trestle along the water front of Bridesburg to reach Tacony, its northern terminus. Construction is also progressing on other sections. The located line is from the Atlantic Refinery, on the Schuylkill River, via the Schuylkill and Delaware River fronts, to Tacony, with sundry branches,

a total length of about 23½ miles, all in the city of Philadelphia. This road is intended to connect the various lines entering the city, and to open up the river fronts and manufacturing districts to all such roads on equal terms. In some cases, where the tracks of existing railroads can be used, under traffic contracts or other proper agreements, independent tracks for the Belt Line are not being built.

Philadelphia & Frankford.—At a special meeting of the company at 227 South Fourth street, the capital of the company was increased from $400,000 to $500,000. This increase in the capital was made necessary by the extensions of the road that are being made at present in the Frankford district, in the northern part of Philadelphia. A large force of men has begun work at Crescentville, where the line connects with the Philadelphia & Newtown road. Work will be confined for a time to an 18-ft. cut through a ridge a short distance west of the Newtown road.

Philadelphia & Reading.—The work of building the connection between Olney and Logan stations, Pa., is under contract, and has been commenced on the east end at Olney, near Philadelphia.

Piedmont.—Construction work on this line has been stopped for the present, two miles of track having been laid this year from Piedmont Junction on the Silver Spring & Gulf Road north to Rossville, Fla. The traffic at present is entirely phosphate products. It is intended to extend the line five miles further north to the Eagle phosphate mines and connecting also with the Florida Central & Peninsular.

Pine Bluff & Eastern.—The articles of incorporation for this company were filed in Arkansas this week, the capital stock being $800,000. The company is a reorganization of the Pine Bluff, Monroe & New Orleans, Pine Bluff & Swan Lake and Pine Bluff & White River, which operate the line from Pine Bluff southeast to Swan Lake, Ark., 33 miles. The road is to be extended to Bayou Meta, as already noted, and also in an northeasterly direction toward St. Charles, Ark., but the terminus is not definitely decided upon. F. M. Gillette, 3 Wall street, New York City, is President, and A. V. Stafford, of Pine Bluff, is General Manager.

Portland & Rumford Falls.—The Maine Railroad Commissioners will make an examination of the Rumford Falls extension on July 25 and 26, and as soon as their approval is given the new line will be opened for regular passenger trains from Gilbertville East to Rumford Falls, 15 miles.

St. Louis & Birmingham.—The grading south of Clifton, Tenn., which was begun several months ago along the Tennessee River by a small force of men employed by the company, has been temporarily suspended and all construction work is now at a standstill.

St. Louis, Hannibal & Kansas City.—This company has completed this year the extension of the St. Louis & Hannibal through Ralls County between New London and Perry, Mo. The line is about 18 miles long, extending from a point about 1¼ miles south of New London, southwest to Perry. The company is also building three miles of road between Hannibal and Oak Wood, Mo., at which point it also connects with the track of St. Louis & Hannibal, and this company will operate both lines.

Saltair.—This company filed an amended charter last week at Salt Lake City changing the name of the road to the Salt Lake & Los Angeles. The road has been practically completed for about 15 miles southwest of Salt Lake City to Saltair Beach, but the work has been delayed owing to injunctions and suits over the right of way.

Seaboard Air-Line Belt.—The contract for grading this belt line to be operated by the Georgia, Carolina & Northern, was let last week to the Southern Supply Company, of Birmingham, Ala. The new road is to be 8¼ miles long, extending from North Decatur, on the Georgia, Carolina & Northern, to Howells on the Western & Atlantic, crossing the Richmond & Danville about six miles from Atlanta, near Belt Junction. The work was begun on July 14 and a large force will be employed, the contractors having only 90 days to complete the grading, bridges and trestle work. The contractors will have about 350,000 cu. yds. of excavation to do, about 35 per cent. of the work being classified material. The maximum grade is 1.2 per cent. on tangents, equated for curvature, and the maximum curvature is over five degrees. There are two iron bridges to be built, 125 ft. and 100 ft., one being a through span and the other a deck span. The company has made a traffic agreement with the Western & Atlantic by which it will run trains over the track of that road from Howells into the Union Passenger Station in Atlanta. The engineers in charge of the work will be O. L. Cloud, Engineer of Roadway of the Georgia, Carolina & Northern, and W. P. Stalraner, Resident Engineer.

Southwestern (Florida).—This company, recently organized in Florida, will succeed the Western of Florida and the Green Cove Springs & Melrose, the latter road being 10 miles long, from Green Cove Springs and the Western of Florida 24 miles to Melrose, Fla. The new company has practically begun the operation of the line between Green Cove Springs and Melrose, which until recently has been in a Receiver's control. Dexter Hunter, of Jacksonville, Fla., President of former company, is President of the new corporation also.

Tamaroa & Mt. Vernon.—The track laying on this extension of the Wabash, Chester & Western will probably begin next week and the engineers expect to have all the track laid by Sept. 15. At present about 16 miles of the grading between Tamaroa and Mt. Vernon has been completed and 125 construction trains are being used on the work; about 35 per cent. of the trestle work has also been finished. The contractors are N. W. Irish, of Carlyle, Ill., and Taylor & Lutz, of Indianapolis, for the bridge work and the Phœnix Bridge Co. for the iron bridges. The alignment of the line is excellent, the road being nearly direct between the termini, the only deviation being made to avoid a hill. The grading is rather heavy owing to an adverse grade being reduced to a minimum; there are only two fills in the entire distance. The maximum curvature, except at stations, is two degrees and the maximum grade is less than 1 per cent. The line has excellent terminals and connections at Mt. Vernon and at Tamaroa, where a junction is made with the Wabash, Chester & Western. Robert Moore, Laclede Building, St. Louis, is Chief Engineer and E. A. Wilder, of Tamaroa, is Resident Engineer.

Turtle Creek Valley.—The Pennsylvania has recently placed under contract the Lyons Run Branch, which leaves the main line of this branch at a point 3.8 miles above the connection with the Pennsylvania at Stewart Station, Pa., and extends up the valley of Lyons Run for a distance of about four miles to reach new coal openings of the Elkins Coal Co. The Turtle Creek Valley road was completed in September, 1891, from a point on the Pittsburgh Division of the Pennsylvania at Stewart Station to Murrysville, Westmoreland County, Pa., a distance of about six miles. The road is now being extended beyond Murrysville, a distance of about five miles, to reach new coal openings of the Westmoreland Coal Co. The work on both of these extensions is very light, being principally scraper work, and the grading is now about two-thirds finished. Tracklaying will be commenced about Sept. 1. D. F. Kennan, Philadelphia, is the contractor for all the work, including tracklaying. There are a number of small girder spans, but no important bridges on the line of this road. The maximum grade on the extension beyond Murrysville is 0.6 per cent. and the maximum curvature 11 degrees. On the Lyons Run Brauch the maximum grade is two per cent. and maximum curvature eight degrees. The officers of the company are J. N. Du Barry, President, J. R. McClure, Secretary and Treasurer, Joseph U. Crawford, Chief Engineer, all of Philadelphia.

Utah, Nevada & California.—A new charter was filed in Utah last week consolidating the Utah Company with the Nevada section, which has been heretofore called the Nevada & California. The line in Nevada is 100 miles long, and $1,000 a mile of the capital stock is said to have been subscribed and paid in. The proposed line is 700 miles long.

Wilkes-Barre & Eastern.—The building of this road east of Wilkes-Barre, Pa., has been stopped by the Philadelphia & Reading, which has laid the track across the new roadbed and has stationed a force of men to prevent the new company removing the rails that have been laid.

Yakima & Pacific Coast.—Griggs & Huestis, of Tacoma, Wash., the contractors for this branch of the Northern Pacific, have increased the force working on the road this month, and expect to complete the entire line by the early fall. The track has been laid to the western side of the summit of the mountains in Pacific County, 30 miles of track having been laid and the road ballasted for the same distance. Col. Huestis says that before the grading is done 250,000 or 300,000 cu. yds. of earth will have to be removed. The grade from the end of the track to South Bend, 28 miles, will be ready for the rails in 60 days.

GENERAL RAILROAD NEWS.

Addison & Pennsylvania.—This road has been sold under foreclosure by Referee C. F. Kingsley, of Bath, N. Y., to Thomas C. Platt, William Brookfield and Augustus C. Gurnee, of New York, for $50,000. The road is to be made standard gauge and will, with the Sinnemahoning Valley, form a connecting link between the Western New York & Pennsylvania at Port Allegany, and the Erie at Addison. The line is 46 miles long, and extends from Addison to Galeton, N. Y. Frank M. Baker is Superintendent.

Chicago, St. Paul & Kansas City.—At a meeting of the stockholders, at Dubuque, Ia., July 15, the lease of the property of this line to the Chicago Great Western was formally ratified. There were 133,569 shares voted out of a total of 148,929.

Chicago & Southeastern (Indiana).—This road has again been placed in the control of a receiver, E. L. Lane, of Lebanon, Ind., securing the appointment. The order was issued on the petition of merchants along the line, who stated that the road was not now being operated, and alleged further that the company was bankrupt, and unable to operate its line. Trains have not been run for some weeks owing to a strike of employés, but it is hoped that the receiver may adjust matters.

Cincinnati, Hamilton & Dayton.—The special meeting called for July 18 to vote on the ratification of the lease of the Cincinnati, Jackson & Mackinaw, and to authorize a guarantee of that company's bonds, has been postponed owing to an injunction to prevent the meeting obtained by George H afer, a stockholder of the company, and President of the Cincinnati, Labanon & Northern.

Illinois Central.—The income from traffic for the eleven months ending May 31, 1892 and 1891, is as follows:

	1892.	1891.	Inc. or dec.
Miles operated.....	2,888	2,875	13
Gross receipts.....	$17,385,935	$16,470,230	I. $1,215,705
Oper. expen. and taxes.	12,868,623	11,647,479	I. 1,221,184
Net earn	4,817,312	4,822,791	D. 5,479

The gross receipts from traffic for the month of June, 1892, are estimated at $1,500,403; for June, 1891, the receipts were $1,411,325; the estimated increase being $89,078.

London & Port Stanley.—The lease of this road to the Great Western (Grand Trunk) which was made in 1872, expires Aug. 1. The City of London, Ont., which owns the road, will lease it to a company which may possibly change it to an electric road or continue to operate it as a steam road. It is about 53 miles long, extending from Port Stanley on Lake Erie to London, Ont.

Long Island Elevated.—The company was formally dissolved on its own application this week. It was incorporated June 1, 1886, with a capital of $1,000,000. In its petition for voluntary dissolution it stated that it had been unable to procure the consent of property owners or the local authorities along its contemplated routes, and that since its incorporation another elevated road had been built over the principal part of its line. Its only indebtedness is $34,000, due the Atlantic Avenue Railroad, and its assets are $40,344 in cash.

Sandy River.—Weston Lewis and J. S. Maxcy, of Gardiner, Me., have secured a controlling interest in the stock of this narrow gauge road, having purchased the stock of Frank Jones, Payson Tucker, President Beal and others. The new owners will make no change in the management of the railroad at present. In buying the road they have in view the construction of the railroad between Gardiner and Farmington, the charter for which was secured at the last session of the Legislature. The road is 2 ft. gauge and is 18 miles long, extending from Farmington to Phillips, Me., connecting at the latter town with the Phillips & Rangeley road; also of a 2 ft. gauge which is in operation to the Rangeley Lakes.

Zanesville & Ohio River.—Judge Phillips has appointed J. Hope Suter, General Manager, as Receiver for the road. A suit, brought by the Mercantile Trust Co., of New York, to foreclose a mortgage of $2,000,000, securing the bonds, has been pending nearly two years, with little or no disposition to push it. It is in this case that the Receiver was appointed.

TRAFFIC.

Traffic Notes.

The Wheeling & Lake Erie is to run all its main line passenger trains into Wheeling, and will run a through sleeping car each way between Wheeling and Toledo every night.

The newspapers say that the low passenger rates between Cincinnati and New York, which began with the Christian Endeavor Convention, are still kept up. The round trip rate as late as July 18 was $13.

A daily vestibule train has been put on between Washington and Chattanooga over the Norfolk & Western and the East Tennessee, Virginia & Georgia, quickening the time to Chattanooga and Memphis three hours. This train will carry the New York and New Orleans sleeper, which leaves New York at 5 p. m.

The Trunk Line Executive Committee has taken action looking to the discontinuance of some of the low tariffs by which, on freight from the west, Boston rates are made applicable to a large number of interior New England towns. The Trunk Lines absorb arbitraries on some of these rates and this they intend to do as little as possible.

In response to the demand for harvest hands in North and South Dakota and Western Minnesota, all the roads reaching that territory, with terminals at St. Paul, Minneapolis, Winona or La Crosse, have agreed to make a one-way rate of $5 a passenger for parties of five or more. These rates will be in effect only during the first week of August.

The members of the Inter-State Commerce Commission, who have been holding an inquiry at Chicago, heard complaints in Omaha on July 19, and went from there to Ogden, Utah; Boise City, Idaho, and Los Angeles, Cal. The principal complaint at Omaha was concerning the rates over the Union Pacific bridge. The complaint about illegal rates on corn from Nebraska to Baltimore, which was published several months ago, was presented to the commission.

The Business Men's Union of Minneapolis has filed a complaint with the Interstate Commerce Commission alleging that the Chicago, Milwaukee & St. Paul, the Chicago, St. Paul, Minneapolis & Omaha and the Chicago & Great Western are maintaining the same rates on dressed beef as on live stock from Missouri River points to Minneapolis. They claim, in the complaint, that these rates discriminate in favor of the Missouri River packers, against the yards at New Brighton, near Minneapolis.

The following is the demurrage clause prescribed for all freight tariffs issued in joint-committee territory:

Under this tariff when freight is to be loaded by consignor or unloaded by consignee, $1 per car per day or fraction thereof, for delay beyond 48 hours in loading or unloading, will be added to the rates named herein and constitute a part of the total charges to be collected by the carrier on the property; except, however, when in conflict with car-service association or local regulations at shipping point or destination, in which case such car-service association or local regulations shall prevail.

Chicago Traffic Matters.

CHICAGO, July 20, 1892.

There has been considerable cutting of rates by the Lake Lines and yesterday the Anchor Line reduced sixth class, which takes most of the commodities, from 17½ to 15 cents, to New York.

The prosecution of the scalpers seems to be subject to a great many delays. It is reported that the Burlington road has abandoned its efforts to punish them, but the officers of the World's Fair Committee announce their intention to persevere until convictions are secured.

The Columbian passenger committee is considering the establishment of a model ticket office at the World's Fair, and members of the committee say that the question is about decided in the affirmative.

People who are posted seem to think that the efforts of the Burlington to pick flaws in the Western Traffic Association agreement are based not on the rate cutting which was perpetrated several months ago, but on a question of rates from Nebraska and western points to the Atlantic seaboard via Beardstown and the Ohio & Mississippi. This route is one over which the Burlington has done a good deal of Eastbound grain business, and at rates which the Commissioners probably will not approve.

The round trip passenger rate to New York over the New York, Chicago & St. Louis is now $16, the tickets being good to return until September 15. They were issued for the Chicago Chess Club, but it is said that the brokers' offices have plenty of them.

The investigation begun by the Interstate Commerce Commission last week came to an abrupt end, the officers of the Calumet & Blue Island and the other roads which form switching tracks for the Illinois Steel Company refusing to give the desired testimony about the ownership of stock or to produce the books of the company without an order from the Executive Committee. The Interstate Commerce Commissioners applied to the United States Court here for a compelling order and the application is to be heard Sept. 6. President Brinson said his road did not pro rate with the long lines, but was paid simply a switching charge. About 500,000 cars a year are handled by the several roads connected with the Steel Works.

Shipments of all freight except live stock for last week from Chicago eastward by all the roads amounted to 58,134 tons, against 51,097 for the preceding week, an increase of 7,047 tons, and against 54,532 tons for the corresponding week last year, an increase of 3,602 tons. The tonnage was divided among the several roads as follows: Michigan Central, 10,108; Wabash, 3,920; Lake Shore, 7,036; Fort Wayne, 5,535; Pittsburgh, Cincinnati, Chicago & St. Louis, 6,472; Baltimore & Ohio, 3,129; Chicago & Grand Trunk, 3,902; New York, Chicago & St. Louis, 4,762; Chicago & Erie, 7,621; Cleveland, Cincinnati, Chicago & St. Louis, 5,649. Lake shipments during the week amounted to 83,401 tons, against 73,475 for the week preceding, an increase of 9,926 tons.

The Chicago & Northwestern has applied to the Western Traffic Association for authority to reduce rates from all lumber points in the Northwest on account of the reduction ordered from Eau Claire by the Interstate Commerce Commission.

A local paper reports Commissioner Veazey as saying: Our investigations generally show that four-fifths of the allegations are groundless. The railroads are observing the law more closely now than they are given credit for. Recently we ran down the charges made by one of the Chicago papers that the roads all over the country were engaged in a general violation of the law. We spent an entire week in New York in probing the charges, and found almost all of them to be without foundation.

GEO. WESTINGHOUSE, JR., President. T. W. WELSH, Supt. JOHN CALDWELL, Treasurer. W. W. CARD, Secretary. H. H. WESTINGHOUSE, General Manager.

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PITTSBURGH, PA., U. S. A.,

MANUFACTURERS OF THE

WESTINGHOUSE AUTOMATIC BRAKE

The WESTINGHOUSE AUTOMATIC BRAKE is now in use on 24,000 engines and 325,000 cars. This includes (with plain brakes) 252,000 freight cars, which is about 23 PER CENT. of the Entire Freight Car Equipment of this country, and about 80 per cent. of these are engaged in interstate traffic, affording the opportunity of controlling the speed of trains by their use on railways over which they may pass. Orders have been received for 173,000 of the Improved Quick-Action Brakes since December, 1887.

The best results are obtained in freight train braking from having all the cars in a train fitted with power brakes, but several years' experience has proven conclusively that brakes can be successfully and profitably used on freight trains where but a portion of the cars are so equipped. Below is a graphical illustration of the progress made in the application of the Automatic Brake to freight cars since its inception

Year.	No. per year.	Grand total.
1881	105	105
1882	1,085	1,190
1883	4,966	6,156
1884	15,051	21,207
1885	10,410	31,617
1886	8,946	40,563
1887	9,281	49,844
1888	27,696	77,540
1889	26,065	103,605
1890	50,502	154,107
1891	39,061	193,168

193,168 freight cars fitted with the Westinghouse Automatic Brake, which is nearly 20 per cent. of the Entire Freight Car Equipment of this country.

E. L. ADREON, Manager, JOHN B. GRAY, Agent. C. C. HIGHAM, General Supt.

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LOCOMOTIVE BRAKES.

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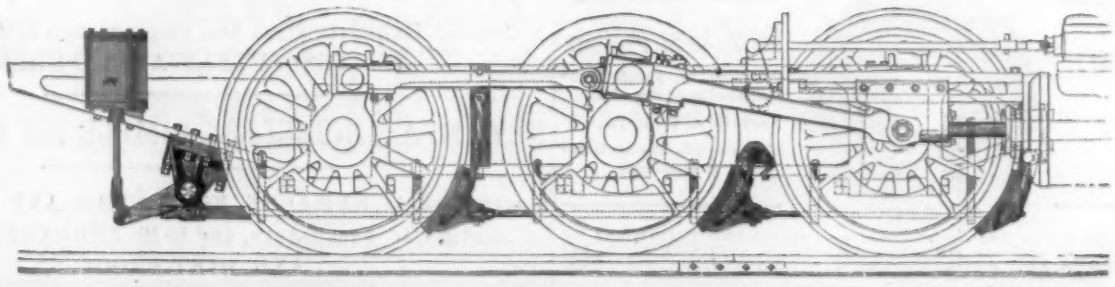
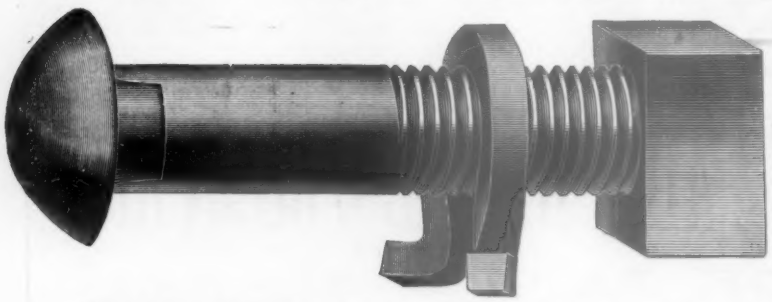


Standard Outside Equalized Pressure Brake, for two or more pairs of Drivers furnished to operate with either STEAM AIR or VACUUM.

THE "STANDARD" NUT LOCK



Manufactured under D. O. Ward's Patents by the

STANDARD NUT LOCK CO.,

NOS. 236-248 BANK ST., NEWARK, N. J.

SAMPLES FREE.

This nut lock is presented on its merits as the best and cheapest device for securing track joints.

It is a torsional loop made of good quality of tempered spring steel, having horizontally inclined foot pieces, which are curved inward, thereby greatly increasing the spring resistance and acting simultaneously; rests upon the base of angle bar, or underlying rail base in case of fish plate, preventing the loop portion from rotating and hammering down *thread* of *bolt*.

The nut lock for ¾ bolt made of ¼ in. square steel, standard pattern, yields a tension of 4,300 lbs. on the bolt, which is sufficient to reduce the wear of the bearing surfaces of the angle bars on the rails, imparting, as it does, a uniform bearing the entire length of the bar.

The "Standard" Nut Lock has sufficient elasticity to maintain a tight joint, which cannot be truthfully said of many light-weight single coil washers.

The "Standard" Nut Lock is, in its superficial form, similar to an annular coil twisted out of plain, *i. e.*, the curved shoulders or ends of the loop proper are spread in the usual manner of spring coils, at which bearing points the locking friction is equal to that of the best single coil washer, and added to this it is terminated in *inwardly curved* extensions, which must apparently furnish additional short leverage spring force of a torsional character.

Distinctive Merits of the "Standard" Nut Lock, Condensed:

Fixedness of position—cannot rotate and hammer down threads of bolt.

Cannot get one end into elongated slot of angle-bar.

Unlike any permanently placed, double washer, the Standard *is* interchangeable regardless of distance between bolts.

Cannot be put on wrong side out, as the outward projection of the foot pieces would prevent the nut being turned up.

Has more spring power directly under the nut than any two ordinary coil nut locks.

Being fixed in position, it offers double the locking friction of nut locks, which when in their *dead* "set" condition turn back with nut by the vibrative effect of passing train.

The "Standard" Nut Lock embodies the old principle of spring power improved by overcoming the objection to the double washer or nut lock, and covering the weak points of the single coil washer.

THE STANDARD COMBINATION TIE PLATE AND BRACE

POSSESSES THE FOLLOWING MERITS:

1. It prevents absolutely the canting of the rail into the tie, thereby greatly increasing the life of the tie.
2. It prevents the rails from spreading or canting over and wearing one side only.
3. The combination of the brace and plate obviates the necessity of spiking the rail and brace separately, thereby saving two spikes and securing the service of the *inside* spike for *holding* the rail; it also prevents the rail from working up and down, and laterally, thus making it impossible to wear the *neck of the spike*.
4. The plate and brace being made of malleable iron, is practically indestructible.

The tie plate and brace is especially useful for curves and guard rails, and also on bridges, whether the rail is laid on ties or on stringers. A tie plate without a brace will not save the head of the spike. A brace without a tie plate will not save the tie, and in a short time the rail will wear into the tie.

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THE ONLY POSITIVE NUT LOCK IN COMBINATION WITH ELASTICITY.

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Made for all sizes of bolts.

A trial is requested.

Samples free of expense.

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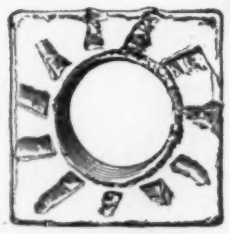

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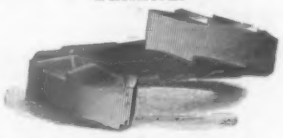
THE AMERICAN "HARVEY RIBBED" NUT LOCK.

A Resilient Spiral Spring Washer with Ratchet-Shaped Teeth.

This is a positive lock, with spring temper, and will not cut thread of nut or bolt.

Patented.



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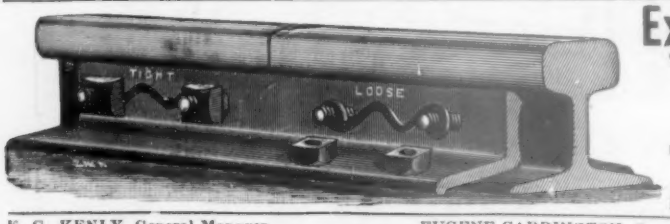

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Sample lots furnished for trial, free of expense, by forwarding the distance between centres of fish-plate bolts. Correspondence and orders solicited.

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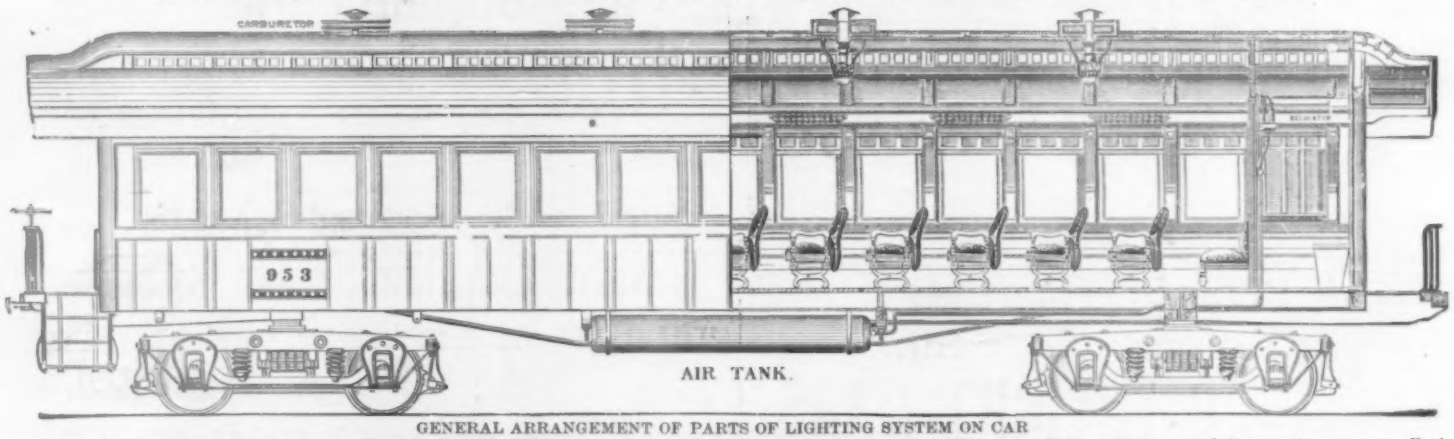

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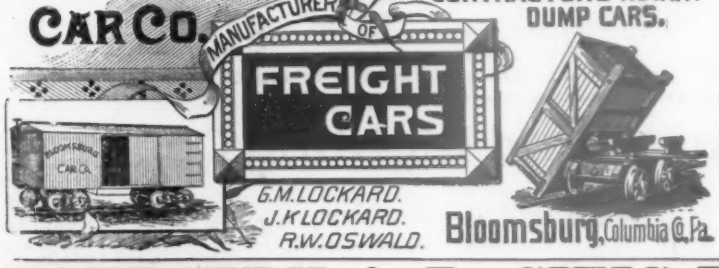
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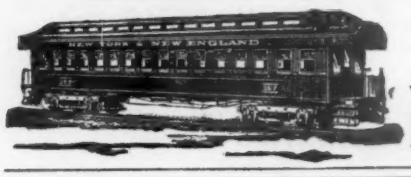
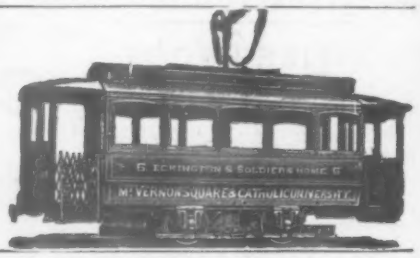

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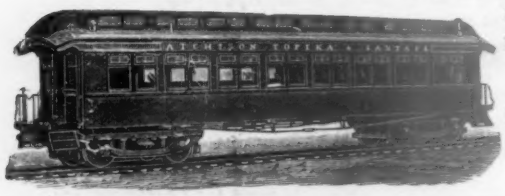

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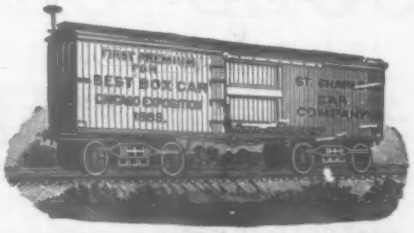

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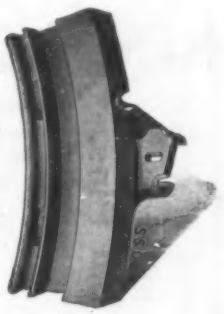

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Automatic Interchangeable Car Coupling Company,

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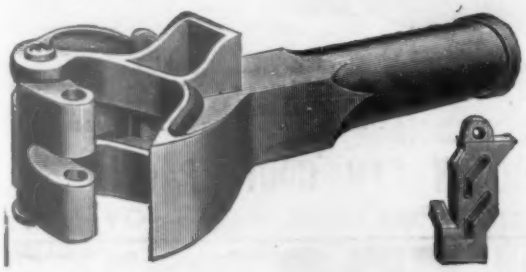

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Simplest, Strongest Best.

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Van Dorston Cushioned Car Coupling Equipment Co.

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Lightest, Strongest and Best. Automatic Self-Opening and Self-Adjusting. Insures Safety to Trainmen. Independent Double-Acting Gravity Lock. No Slack Required to Uncouple.

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Locomotive and Car Axles, Coupling Links and Pins.

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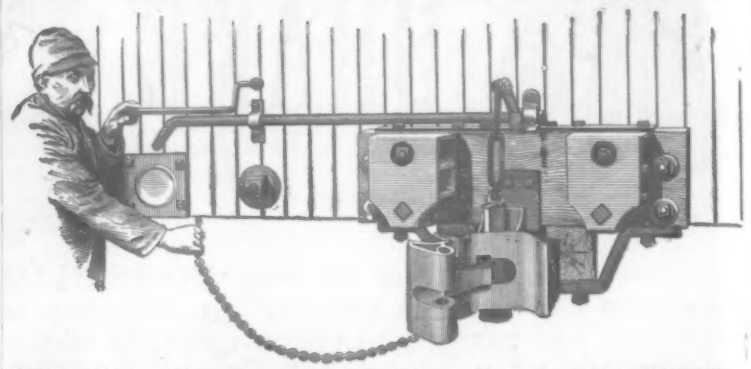
Drawhead, Malleable Iron; Knuckle, Pressed Steel; Pin, Drop Forged Steel.



With Chain Attachment for Opening the Knuckle WHEN REQUIRED.

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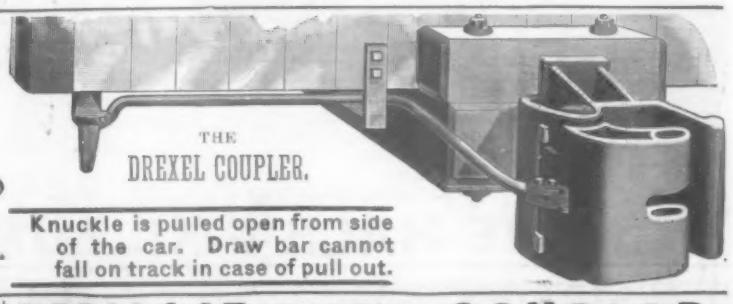

THE DREXEL COUPLER.

Knuckle is pulled open from side of the car. Draw bar cannot fall on track in case of pull out.

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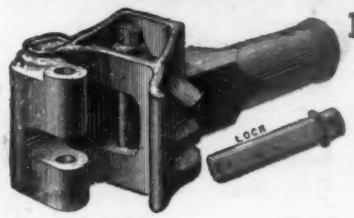

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TENSILE STRENGTH (Fairbank's Test) 139,640. DROP TEST, 700 lbs. hammer dropped 18 ft. 22 times failed to break the knuckle.

Direct drop of full sized pin makes a double lock formed by draw bar at "C" and Pin "D." Equally strong if pivot pin "A is lost. Should pin be lost, use any link—no chains being required. The strongest Knuckle and Coupler known. Cannot be unlocked by any jolt of the cars. Couples with all M. C. B. types. The locking pin drops behind the step on rear of Knuckle "R," and keeps the knuckle always open when cars are separated. Removing the pivot pins, 33 loaded gondola cars were drawn from Paterson, N. J., to West End (18 miles), the pull being entirely on the DOUBLE LOCK.

The drawbar is Malleable Iron. The Knuckle Pivot and Locking Pins steel.

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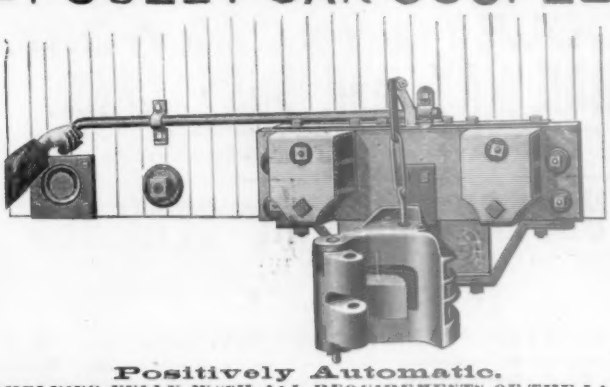
THE POOLEY CAR COUPLER.



Positively Automatic.

COMPLYING FULLY WITH ALL REQUIREMENTS OF THE LAW.

SIMPLE. STRONG. EFFECTIVE.

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TROJAN CAR COUPLER.

M. C. B. TYPE.

THE STRONGEST AND THE ONLY SAFETY COUPLER.

The knuckle may be thrown open for coupling by the hand-rod at the side of the car, rendering it unnecessary for trainmen to go between the cars to open the knuckle. The action is positive, and not dependent on springs or gravity.

The lock has a bearing of four square inches on the knuckle.

N. O. Olsen, Engineer of Fairbanks & Co.'s testing department, says: "IT IS THE STRONGEST COUPLER NOW IN THE MARKET

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IMPROVED ENGINE SPRINGS

EVERY SPRING GUARANTEED.

SEND FOR ILLUSTRATED CIRCULAR.

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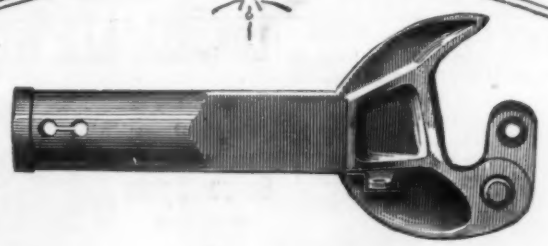
31 & 33 B'way N. Y.

THE JANNEY FREIGHT CAR COUPLER



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THE JANNEY-HIEN COMPANY

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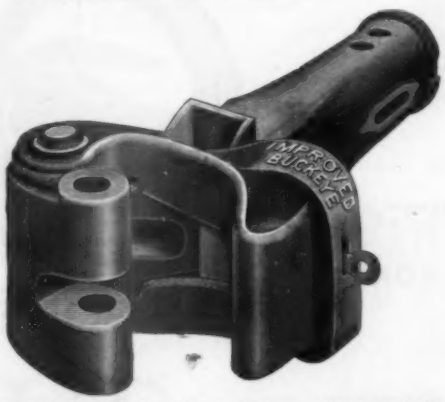
Master Car Builders' Standard in every particular. Combines the greatest obtainable strength and simplicity. Only Three Parts. Positive acting gravity lock and positive mechanical opening of knuckle. Absolute Central draft. Same movement that raises the lock throws open the knuckle.

Adopted as Standard by Several Leading Railroads After Severe Tests and Long Trials.



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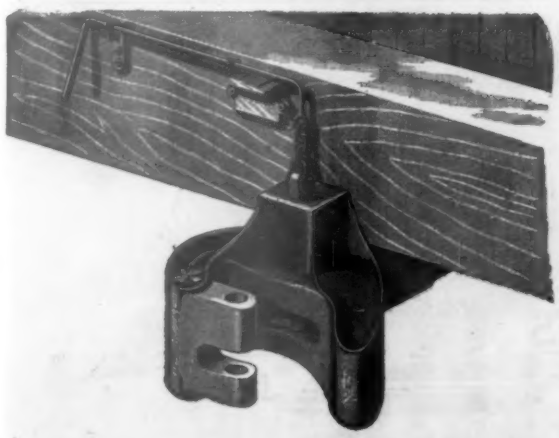

The Lightest, Simplest and Least Expensive Coupler in the Market.

WEIGHT 180 POUNDS.

MEETS ALL THE REQUIREMENTS OF THE M. C. B. LINES AND TESTS.

LOCKING DEVICE SIMPLE, DURABLE AND EFFECTIVE

It Has but Four Parts and Cannot Be Opened by Accident.

KNUCKLE OPENS AUTOMATICALLY.

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CAPACITY, 400 WHEELS PER DAY.

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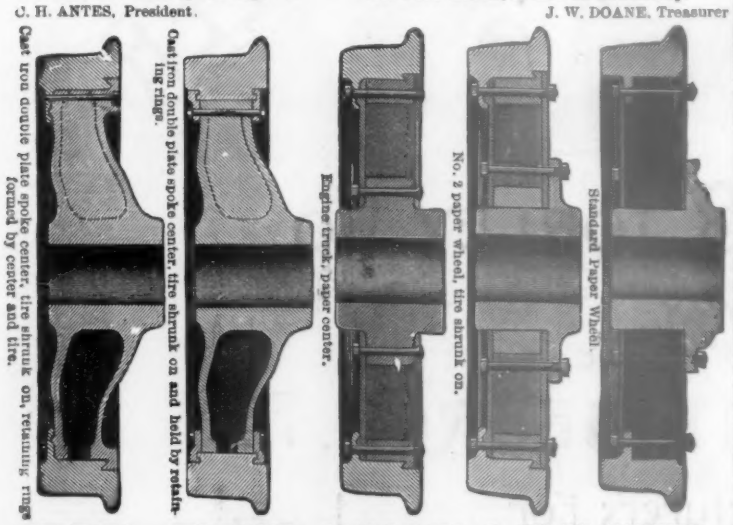
Cast iron double plate spoke center, tire shrunk on, retaining rings formed by center and tire.
Cast iron double plate spoke center, tire shrunk on and held by retaining rings.
Engine truck, paper center.
No. 2 paper wheel, tire shrunk on.
Standard Paper Wheel.

STEEL-TIRED WHEELS FOR CAR, LOCOMOTIVE AND TENDER TRUCKS

DICKSON CAR WHEEL CO.,

Manufacturers of all Sizes of **ENGINE, TENDER** and

CAR WHEELS,

In either the **COMMON** or

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STEEL-TIRED WHEELS

CAST-STEEL WORKS

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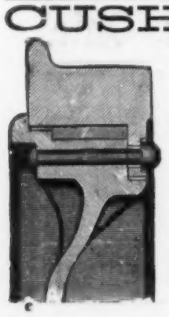
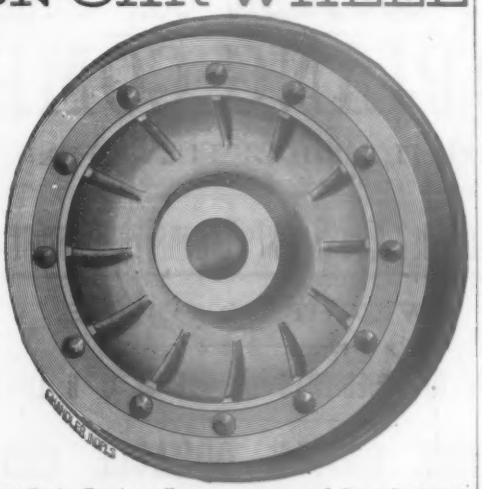


RECORD 40,000 MILES. 1-16 INCH WEAR.



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Durability.
Economy.
Elasticity.
Safety.
Noiseless.

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Double Plate, Single Plate AN **Hollow Spoke WHEELS** FOR Broad and Narrow-Gauge Cars Engines and Tenders.

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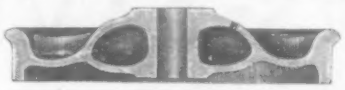

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HIGH GRADE CHILLED CAR WHEELS

ALL WHEELS GUARANTEED TO STAND PROVING

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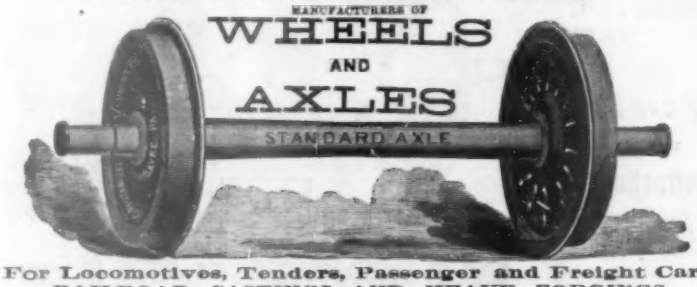

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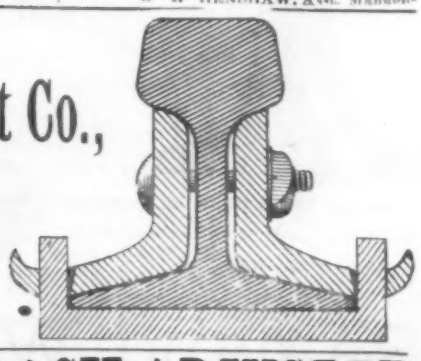

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Simple. Compact. Effective.

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ONE ADJUSTER PER CAR.

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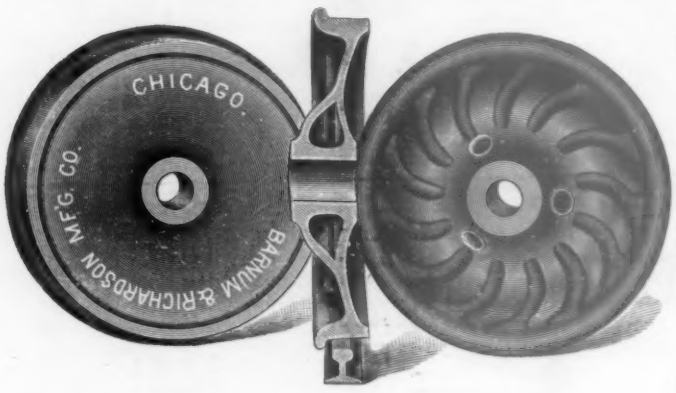

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STREET CAR WHEELS,

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Salisbury Charcoal Pig Iron, Street Railway Curves, Crossings, Frogs and Switches.

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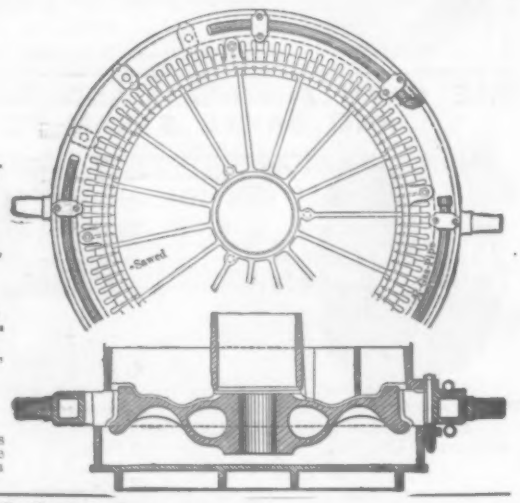

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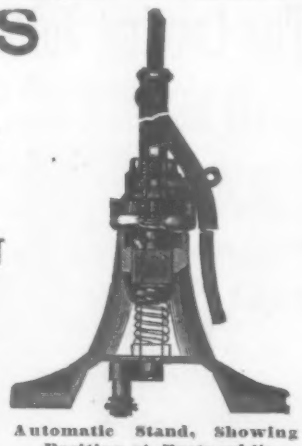
Automatic Stand, Showing Position of Parts while being Thrown by Hand



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CHILLED IRON CAR WHEELS

FROM SPECIAL QUALITY CHARCOAL IRON

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CONGDON SHOES MADE BY RAMAPO WHEEL & FDY CO
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Snow's Rigid Steel-Tired Wheels,

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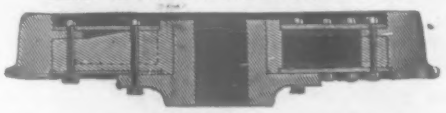

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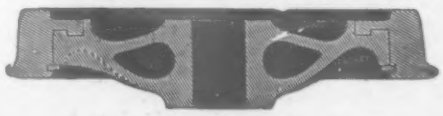

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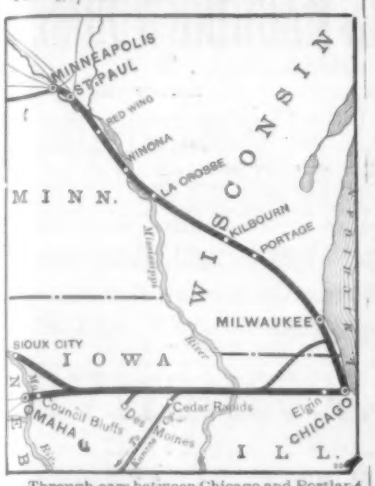

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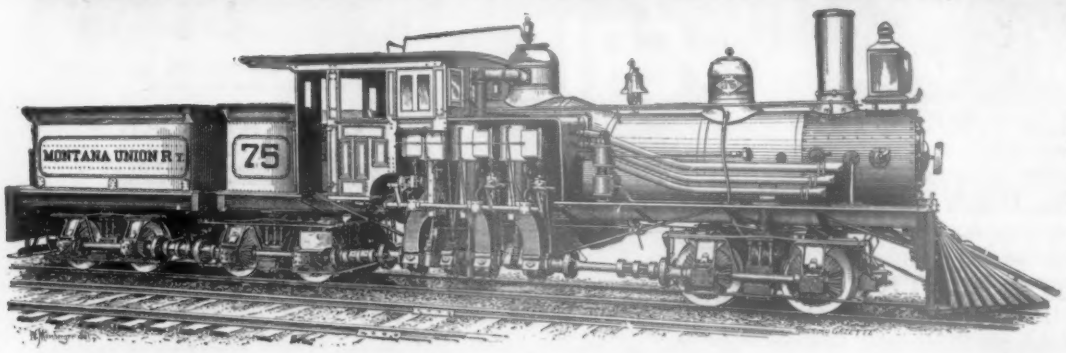

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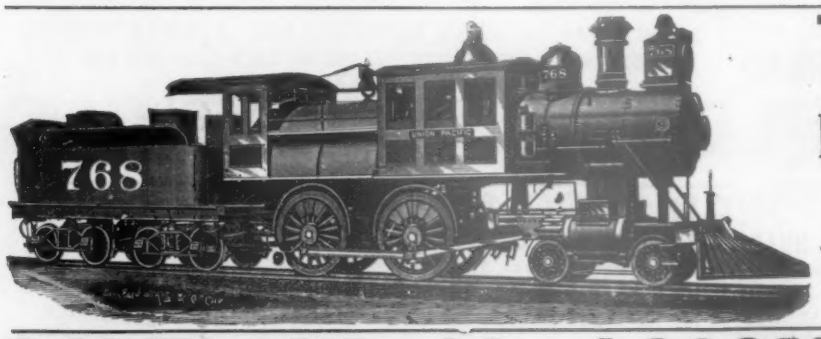

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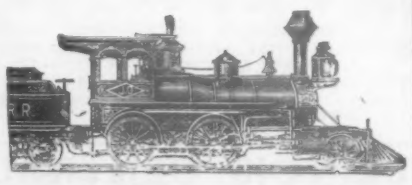

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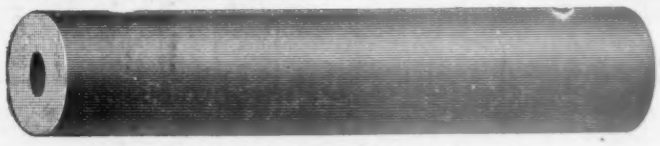

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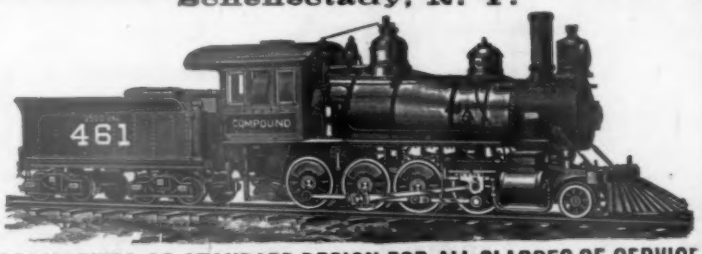

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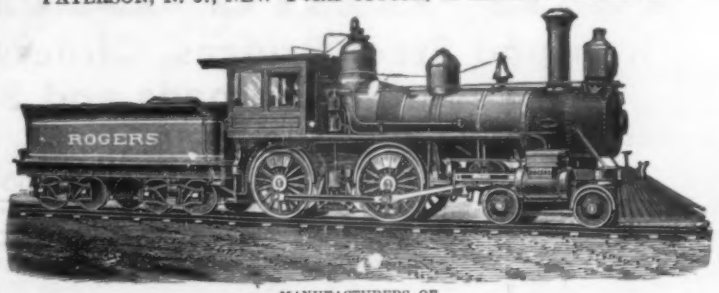

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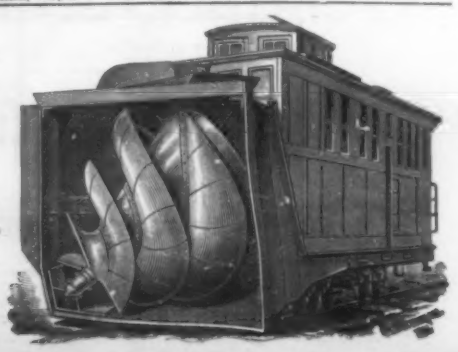

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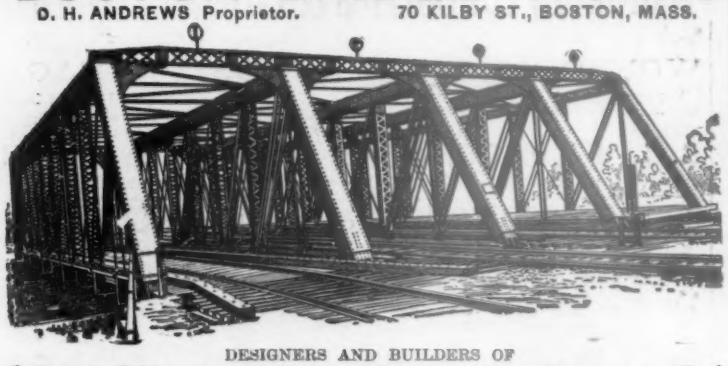

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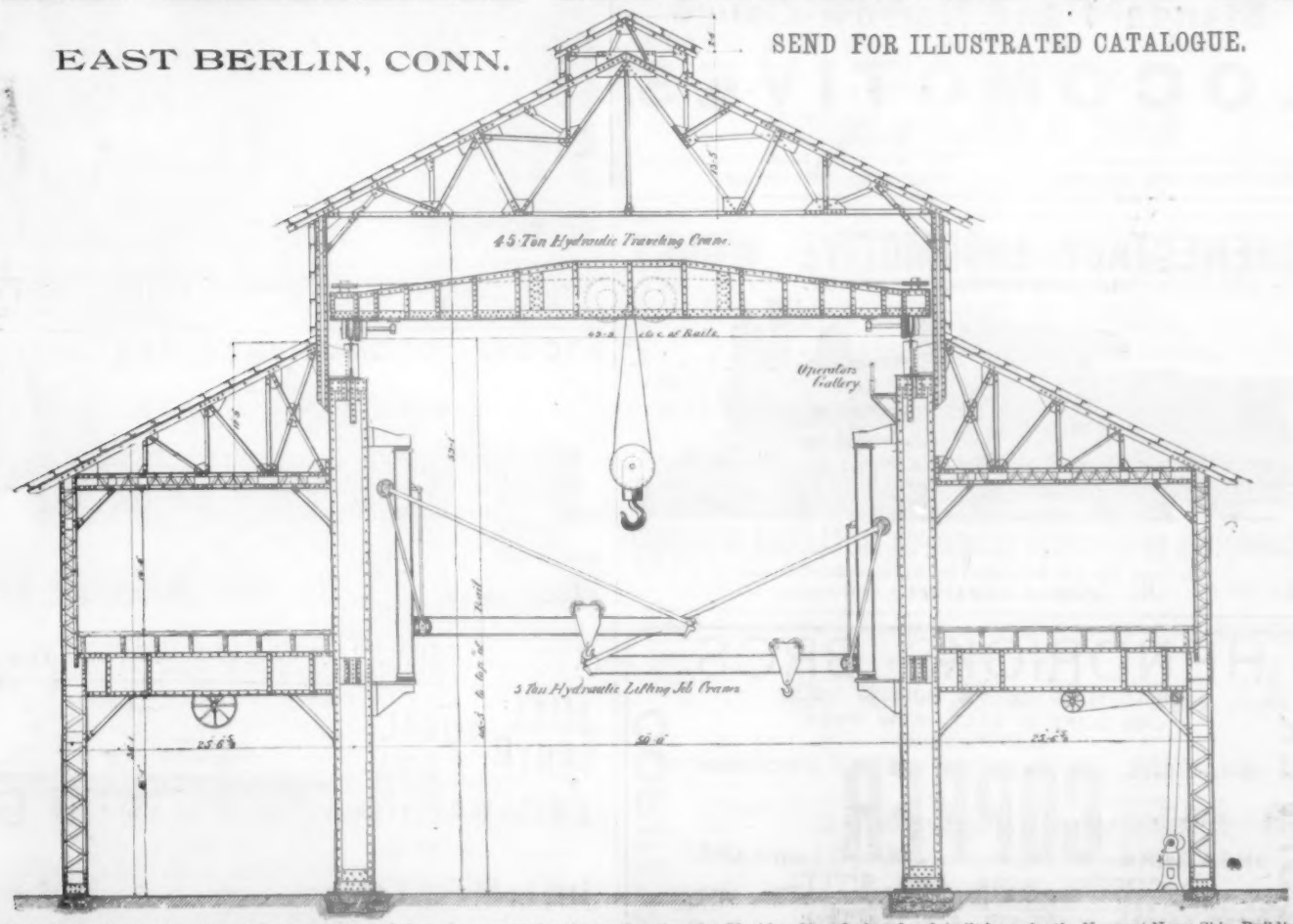

The above illustration is taken direct from a drawing, and shows in cross section the construction of a Machine Shop designed and built by us for the Newport News Ship Building & Dry Dock Co., at Newport News, Va. The general dimensions of the building are given in the above illustration, excepting the length, which is 300 ft. The central portion is controlled by a 45-ton Hydraulic crane, with a travel the full length of the building. The wing trusses and floors are designed to carry shafting, machinery, etc. The entire framework of the building is made of iron, being inclosed by a light brick wall between the iron posts.

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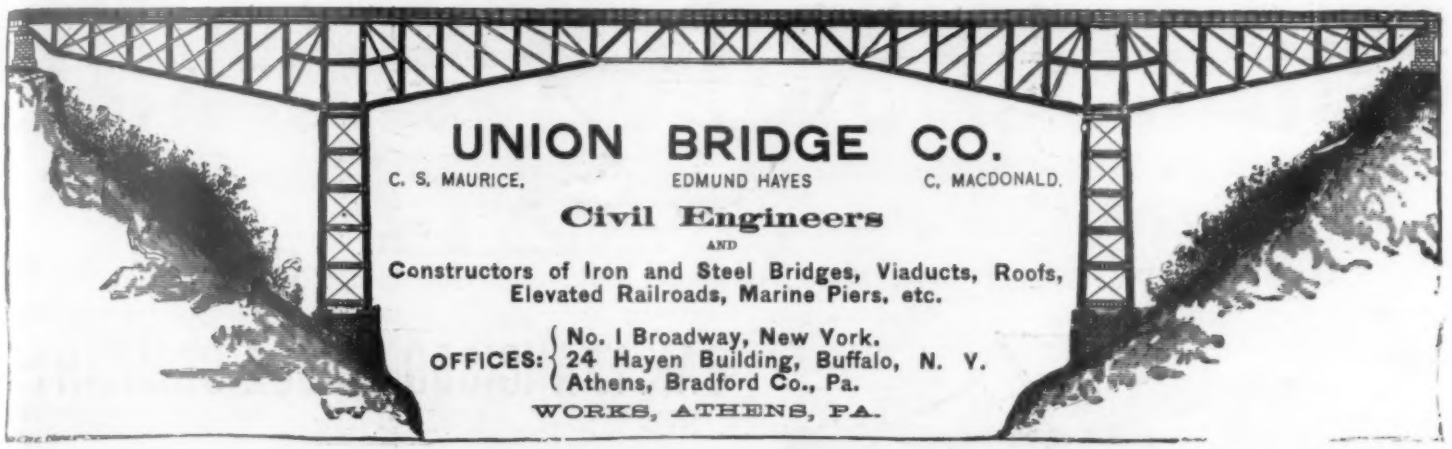

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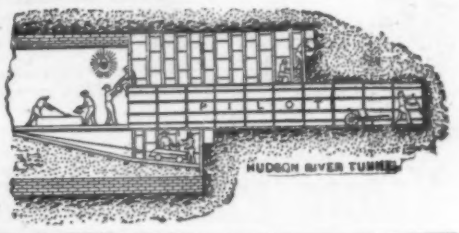

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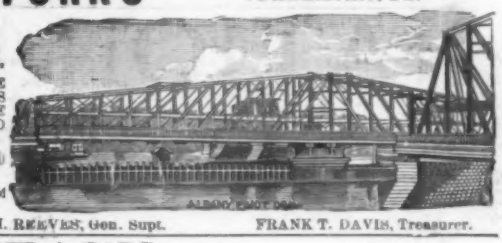

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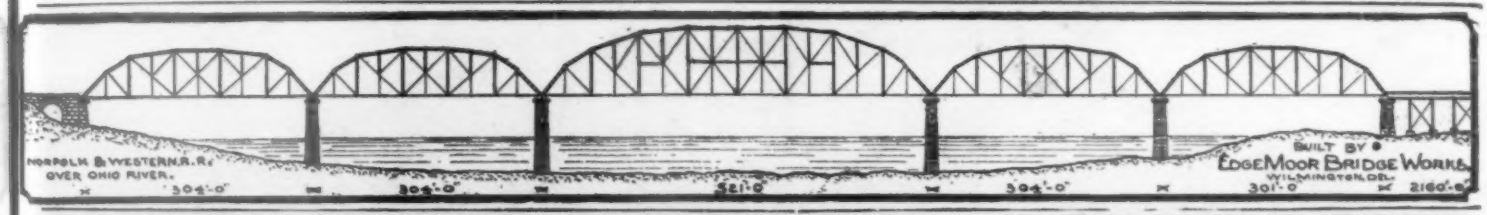

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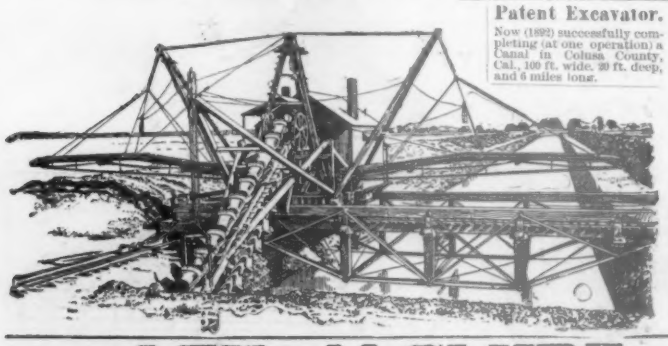

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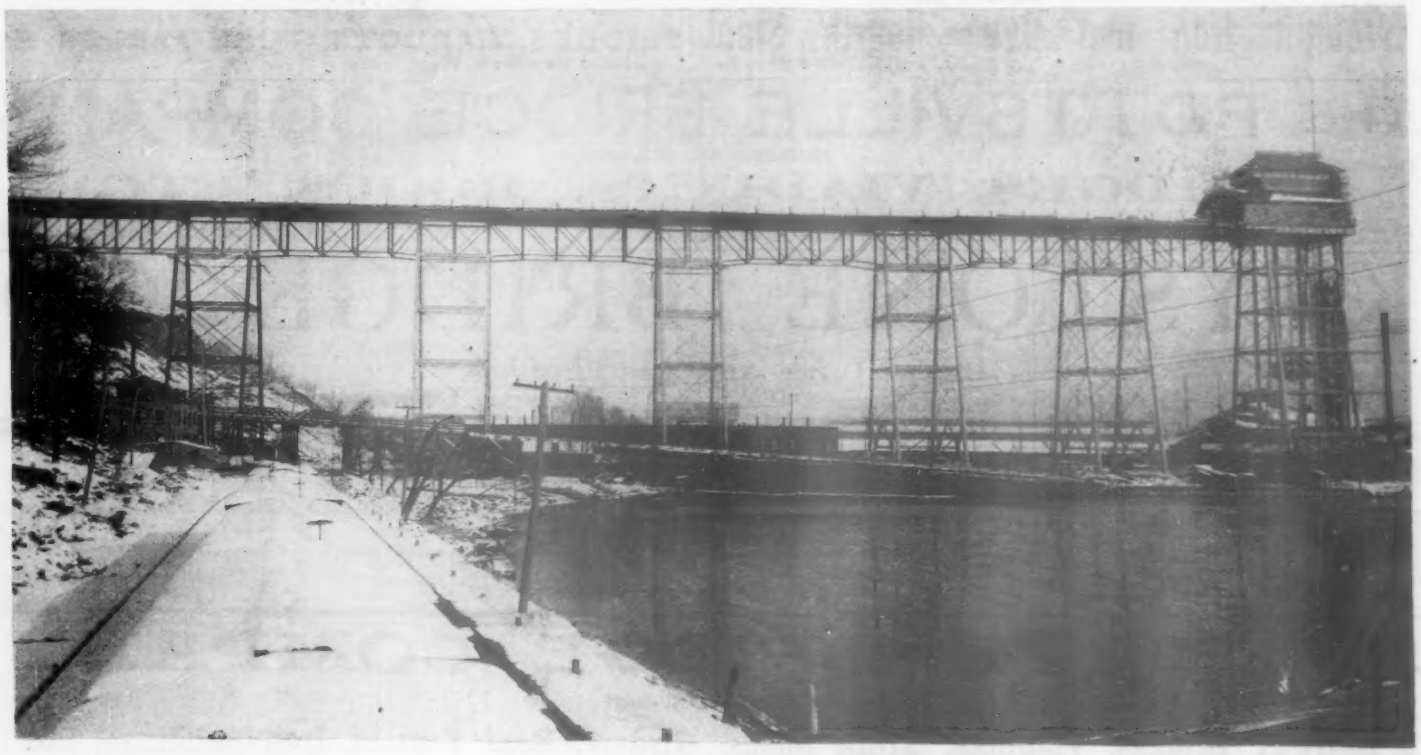

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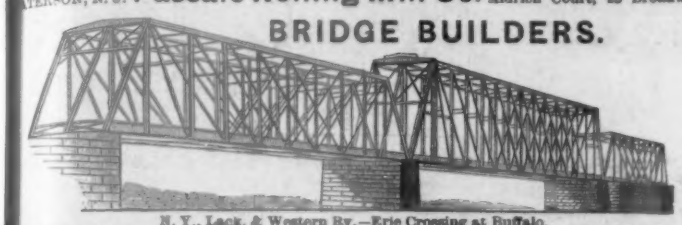

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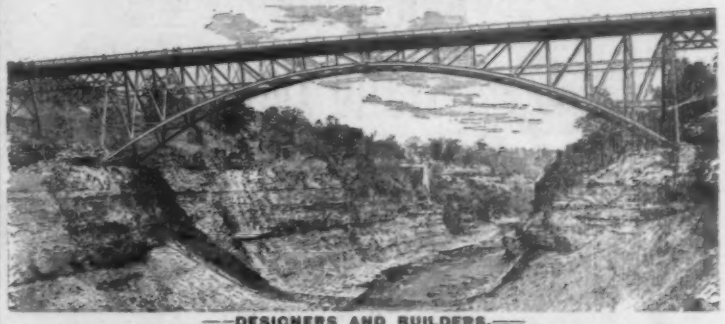

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